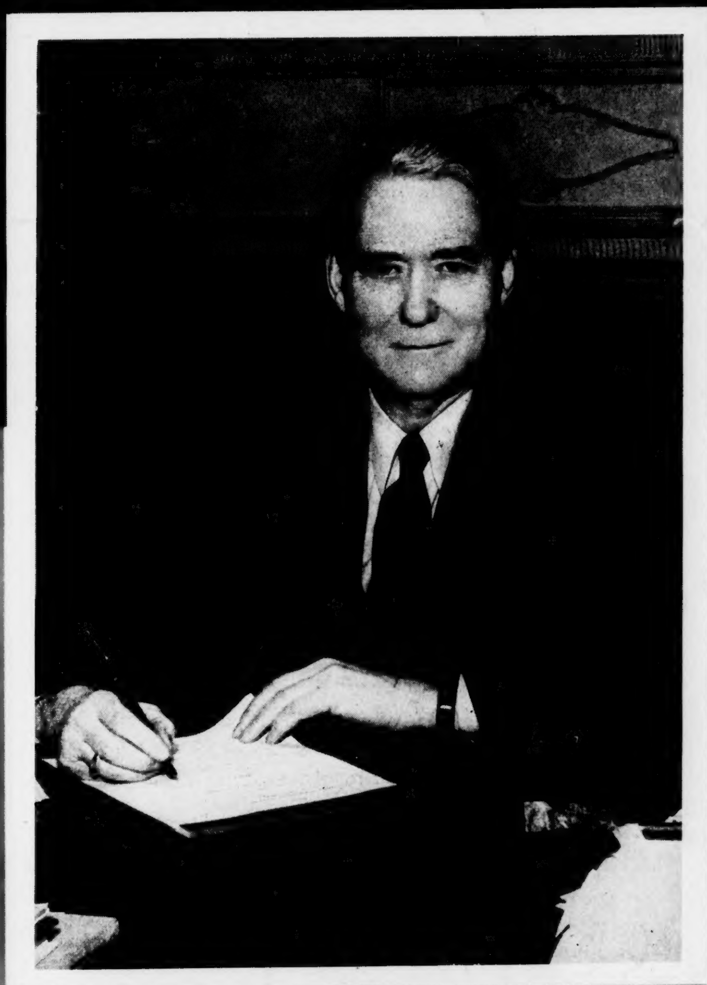
Metals Review

October 1958



Ernest E. Thum
Honorary Member A.S.M.
(See Article, Page 5)

Metals Review

The News Digest Magazine

October 1958
Vol. XXXI, No. 10

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Metal Progress Editor-In-Chief
E. E. Thum Made Honorary Member A. S. M.

WHEN ERNEST THUM came to the American Society for Metals (then the American Society for Steel Treating) as editor of the embryonic *Metal Progress* in the summer of 1930, he received only one directive: "Produce a magazine which will bring information about metal progress to engineers and metallurgists engaged in production". The success with which he carried out this directive is evidenced by the Honorary Membership in the American Society for Metals recently conferred upon him in recognition of "the tremendous contribution which he has made to the growth of the Society through the work done in the field of the Society's publications".

By 1930 the American Society for Steel Treating had broadened its activities to such an extent that publication of convention papers—primarily discussions of new researches in the science of metals—in *Transactions* no longer satisfactorily covered the interests of the majority of members. Nearly 75% of the Society members were practicing metallurgists engaged in the manufacture of raw material or its further fabrication into useful parts. What was needed was a magazine, informal in style and format, which would put emphasis on the production, inspection, fabrication, treatment and use of metals rather than on theoretical concepts and laboratory experimentation.

Becomes Editor

The job as editor of this new magazine was offered to Ernest Thum, then sitting behind an editorial desk at *Iron Age*. It was quickly accepted, because it was a unique opportunity for a unique man. The only stipulation attached to the job was that stated in the first paragraph; just how the editor should go about producing this magazine was left entirely in his hands. Lay-out, style, scope of material and all phases of the magazine's production were to be his sole responsibility. It was an editor's dream of an ideal job.

Qualifications for the Job

Mr. Thum's qualifications were eminently suited for such a job. Born and raised in the West, he had graduated from the Colorado School of Mines in 1906 (one of his most prized awards is the 1951 Silver Medal of the Colorado School of Mines "for personal excellence and distinguished achievements in the field of metallurgy"), and worked in Western copper smelters for eight years before traveling eastward to Cincinnati. After two years as professor of metallurgy at the University of Cincinnati, in 1917, with his wife (the former Clara Orr who died in 1944) and four children, he moved to New York to become associate editor of McGraw-Hill's *Metallurgical and Chemical Engineering*. Six years later, when the publication dropped metallurgy from its title and interests, he headed the new technical publicity department of Union Carbide and Carbon Corp. In 1927 he resigned to go back to editorial work as principal associate editor of *Iron Age*.

He thus had not only a broad metallurgical background, ranging from field engineering to teaching, but editorial experience and some knowledge of printing. Equally important was his enthusiasm and faith in the task at hand; he himself had once (for McGraw-Hill) prepared extensive studies for just this type of magazine and firmly believed that a magazine such as *Metal Progress*, designed to fill the gap in metallurgical *production* information, could not help but succeed. Although he was hired on his knowledge of the techniques of his trade, it soon became apparent that Ernest Thum's personal attributes were just as important to *Metal Progress*. He had an infinite capacity for hard concentrated work (for 18 years he was a one-man editorial staff), an ability to size up a situation quickly and make swift (and sound) judgments, a strong sense of design and color, and an innate capacity for leadership. All these abilities were channeled into *Metal Progress*.

Cited for Excellence

The first issue of *Metal Progress* came off the press in September 1930—just in time to meet the heavy weather of the depression. Even then the magazine managed to keep out of the red and by 1936 was well on its way, depression notwithstanding. Its caliber has been consistently high since its inception and it was an early winner in contests for editorial excellence sponsored by the National Industrial Advertising Association. Another prized award is the Certificate of Excellence of the American Institute of Graphic Arts for the outstanding entry in the Magazine Show of 1950.

Mr. Thum's love of fine books and fine printing is reflected in the pages of *Metal Progress*. (His only club is the Rowfant Club, a group of Cleveland men interested in fine books.) From the start, he insisted on the highest standards of printing, lay-out and typography, and maintained that the covers should be artistically attractive to compete effectively with other magazines in the readers' homes. In recent years, many of the striking *Metal Progress* covers have been the work of winners of the *Metal Progress* Cover Competition held by the Cleveland Institute of Art each year, a competition organized by Mr. Thum a dozen or more years ago and now an important part of the commercial art curriculum.

The distinguishing features of *Metal Progress*—the monthly data sheet, Critical Points and the atomic age page, to name a few—have been inaugurated by Mr. Thum. The atomic age page, even though it does not deal directly with metallurgy, is included because he feels that atomic energy has introduced an entirely new dimension into the life of humanity, and thus merits space in the pages of *Metal Progress*. This page was started soon after Hiroshima in 1945 and illustrates one of Mr. Thum's strong beliefs: an editor should be a leader. It is the editor's job to foresee important developments and point the way to his readers rather than wait for the reader to note the developments himself. Thus already the atomic age page is occasionally replaced by the astronautic age page, dealing with problems inherent in outer space travel.

It has been this leadership, with an eye to the future, which has kept *Metal Progress* in the vanguard of scientific and technological development. Under Mr Thum's guidance, the policy of *Metal Progress* has always been and will continue to be "one of continuous expansion of effort to match the continuous expansion of the whole field of metallurgy".

In the June issue of Metals Review there were outlined the steps taken by the Board of Trustees of ASM to establish temporary management of the headquarters staff until such time as a Managing Director had been selected.

The Board subsequently appointed a Confidential Committee with the responsibility of recommending to the Board a candidate or candidates for the position of Managing Director of the Society.

To assist the Committee, a firm of management consultants has been retained—Handy Associates Inc., 570 Lexington Ave., New York 22, N. Y.

Suggestions from the members and applications are to be submitted in writing, marked confidential, and addressed either to Handy Associates Inc., or to Mr. G. M. Young, c/o Aluminum Co. of Canada, Ltd., 1700 Sun Life Bldg., Montreal 2, Quebec, Canada.

G. M. YOUNG, President
American Society for Metals

A.S.M. Documentation Program Expanded

Board Takes Action to Speed Up Mechanized Searching Project, Broaden Abstracting Service

THE ANSWER TO THE QUESTION "Is machine searching of Metallurgical Literature feasible?" is YES. This conclusion was reached by the A.S.M. Board of Trustees at its August meeting in Cleveland, on the basis of a report submitted by its Committee on Documentation. In the opinion of the committee, "Machine searching of a mass of previously digested documents is not only feasible but more discriminating and accurate than human searching of conventional card indexes and digest journals. It is also in all probability much cheaper".

This answer to the machine searching question was reached after only three years of a projected five-year research program on mechanical searching. The Board of Trustees has therefore given the green light for a stepped-up pilot plant operation aimed at the establishment of an operating searching service covering current literature possibly as early as 1960.

The research program, conducted for A.S.M. at the Center for Documentation and Communication Research of Western Reserve University, was started late in 1955, and provided for the preparation of 25,000 metallurgical documents in encoded form for machine searching at a cost of $75,000. While this number of documents has not yet been attained, test runs performed on the experimental electronic searching selector built at Western Reserve University have been eminently successful. In these tests actual questions and subjects for searches were volunteered by more than 100 A.S.M. members. Results of the test searches were reported back to the originators of the question and evaluated as to effectiveness of search.

Now that the main question has been answered, the Board of Trustees faced the problem "What next" and authorized an increase in the number of abstracts to be prepared annually for machine searching from 5000 to 7500 at a cost of $22,000 (as against the previous cost of $15,000 per year).

The test program will also be continued during 1959, but will be placed on a strictly current basis. That is to say, encoded abstracts will be prepared from periodical literature as soon as they are received at the Documentation Center. The searching machine will be permanently wired for ten carefully selected typical questions and searches will be made, week by week or month by month, of the current literature as it is processed. (Such a *current* searching service will be the first objective of the eventual A.S.M. Metals Information Center; the building up of a library of encoded abstracts sufficient for bibliographic searches of previously published information will require several years after a current searching service can be established.)

Increasing the rate of encoding from 5000 to 7500 abstracts during 1959 will have several advantages:

1. It will increase the backlog of machine feed which will eventually be necessary for retrospective searching.
2. It will cover the "cream of the crop" in metallurgical literature.
3. It will provide a transition from experimental to operational stage.
4. Primarily, and most important, it will train and build staff for an eventual A.S.M. Metals Information Center.

Expansion of Review of Metal Literature

A further valuable byproduct of this program will be an improvement in the quality of the abstracts appearing in the A.S.M. Review of Metal Literature, published monthly in *Metals Review* and annually in a bound volume. Since 1956 this work has also been performed by the Documentation Center staff under a separate contract, but closely meshed with the machine literature searching program.

Since the start of 1957, in fact, the preparation of an encoded abstract for machine searching and of a conventional abstract for the Review of Metal Literature has been performed simultaneously on each document under review, resulting in much more detailed published abstracts than have been prepared in the past. The increase in machine encoding will mean that 7500 of the 12,000 abstracts in 1959 in the Review of Metal Literature will be of this more informative type.

Financing the Expanded Program

Extensive cost studies of the entire A.S.M. documentation program, including the Review of Metal Literature since its beginning in 1944, were provided to the Board by the Documentation Committee with the help of A.S.M. staff. These studies showed that a very substantial saving in operating expense of the Review of Metal Literature could be attained by a change in methods of printing and distribution. Such a change had already been under discussion with W. H. Eisenman, National Secretary of the Society, prior to his death last May.

As a result of these studies and recommendations the Board decided that the monthly installments of the Review of Metal Literature should be issued in a separate publication rather than as a department in *Metals Review,* and should be sent only to those A.S.M. members who request it. No charge will be made for the Review of Metal Literature to A.S.M. members who request it. A form for this purpose will be found on page 68 of this issue of *Metals Review*. The change will become effective with the January issue of both publications.

As a further saving, investigations are now under way for printing the Review of Metal Literature by photo offset from typewriter type rather than by letterpress. The combined saving provided by cheaper printing and by limited distribution is estimated to be more than double the $7000 increase in the cost of the machine literature searching project at Western Reserve University. Thus A.S.M. members will be provided with a much improved and expanded abstracting service at a considerable savings—more than enough to provide the extra funds required to speed up the tempo of the mechanized searching operation.

Notice of Change in Publication of A.S.M. Review of Metal Literature

Commencing Jan. 1, 1959, the *A.S.M. Review of Metal Literature* will be issued monthly as a separate publication. It will be sent without charge to all members of the American Society for Metals *who notify Society Headquarters* of their desire to receive it. Extra copies to A.S.M. members and single copies to non-members can be had for $6.00 per year in U.S. and Canada, foreign $7.50.

Metals Review, containing chapter and national Society news, will continue to be sent automatically to all members of the Society without charge.

Fill out and mail coupon on p. 68 if you wish to continue receiving the *A.S.M. Review of Metal Literature* as a separate publication.

Discusses Physics of Metal Surfaces

"Friction, Wear and Surface Physics of Metal Surfaces" Was the Title of a Talk by E. M. Kipp, Foote Mineral Co., at a Meeting of the Santa Clara Valley Chapter. Shown are, from left: Perry Slocum, vice-chairman; Mr. Kipp; and Harvey D. Ross, the arrangements chairman for the meeting

Speaker: E. M. Kipp
Foote Mineral Co.

Members of the **Santa Clara Valley Chapter** heard E. M. Kipp, director, research and development laboratory, Foote Mineral Co., speak on "Friction, Wear and Surface Physics of Metal Surfaces".

Mr. Kipp outlined the many variables involved in the friction and wear process, and emphasized the need for fundamental work to understand the basic mechanisms involved. A great deal of basic knowledge must be acquired to develop a comprehensive theory which will satisfactorily describe the friction and wear process. The present state of knowledge in this field was briefly outline and the accepted theories of frictional behavior were described. According to these, the frictional force may be attributed to the work necessary to overcome the plowing effect of the asperities on the rubbing surfaces, the energy required to lift these asperities over one another and perhaps most important, the work required to shear the many minute welds formed at the actual points of contact.

Many of the present theories of friction and wear can only be applied under the specific experimental conditions from which they were derived. This is due to the large number of variables which operate with varying degrees of importance depending upon the conditions under which wear occurs. To produce a general theory for wear applicable under all conditions, a fundamental understanding of these variables and their relative importance under a given set of operating conditions must be developed. Even under the highly simplified conditions of full hydrodynamic lubrication, may variables must be accurately evaluated to obtain a useful picture of the operation. These variables include the load, speed, geometry and properties of the lubricant. During actual bearing service many more compilations must be considered, such as the effect of surface finish, boundary lubrication conditions existing during starting and stopping, and the chemical reactions which may occur between the bearing material and active agents in the lubricant.

Under the severe conditions encountered during rolling or other metalworking operations, the importance of slight variations in surface finish has also been shown. The actual surface roughness may be less important than the process used to obtain a given degree of finish. Distinct variations in the frictional behavior of surfaces with the same roughness number but processed by different techniques have been observed. Mr. Kipp emphasized the need for a cooperative program involving the fields of metallurgy, chemistry and physics to study the problems of friction and wear. Only through such an over-all effort can a fundamental understanding of these problems be developed.—**Reported by R. P. Hunnicutt for Santa Clara Valley Chapter.**

Presents Fundamentals of Corrosion at Detroit Series

Speaker: M. G. Fontana
Ohio State University

In the second lecture of a series of three educational sessions presented by the **Detroit Chapter** on "Corrosion of Metals", Mars G. Fontana, chairman, department of metallurgical engineering, Ohio State University, gave a talk on the "Fundamentals of Corrosion".

Dr. Fontana first gave a resume of common terms, pointing out that corrosion is metallurgy in reverse. The anode is the area where corrosion occurs while the scale forms at the cathode. An alloy is passive if it does not corrode when it normally would.

The eight forms of corrosion are: uniform or general; galvanic; concentration or crevice; pitting; dezincification; intergranular; stress; and erosion. Numerous slides were shown as examples of each type of corrosion as well as methods of protection. The methods of combating corrosion include: alloying; cathodic protection; metallic coating; inorganic or organic coatings; alteration of environment; nonmetallic materials; high-purity metals; and design.

Dr. Fontana's lecture was preceded by a color film furnished by the International Nickel Co. of Canada Ltd., which depicted the electrochemical action in corrosion.—**Reported by John D. Altstetter for Detroit.**

To Hold Air Pollution Conference in Washington

The National Conference on Air Pollution, to be held Nov. 18-20, at the Sheraton-Park Hotel in Washington, D. C., is an interdisciplinary meeting called by Leroy E. Burney, surgeon general, Public Health Service, U. S. Dept. of Health, Education and Welfare, to explore the sources, extent and health and economic effects of air pollution, as well as its control and administrative aspects.

The Conference has been designed to permit the greatest possible participation, not only by air pollution specialists and the various governmental health and planning agencies concerned, but also by professional and scientific associations, physicians, engineers, industries and others interested in this growing problem. Further information is available from the Public Health Service, Washington 25, D. C.

A.S.M. created the Annual Teaching Award in Metallurgy, open to teachers of metallurgy in the United States and Canada. Value $2000.

Cites Criteria for Selecting Metals

John D. Graham (Center), Director of Materials Engineering, International Harvester Co., Spoke on "Criteria for Selection of Engineering Materials" at a Saginaw Valley Meeting. He is shown with J. W. Fredrickson (left), technical chairman, and N. C. McClure (right), chairman

Speaker: John D. Graham
International Harvester Co.

John D. Graham, director of materials engineering and engineering standards, International Harvester Co., spoke on "Criteria for Selection of Engineering Material" at a meeting of **Saginaw Valley Chapter.**

The problem of the materials engineer, simply stated, is one of selecting the proper material and processing for a given part to provide adequate strength and yet remain within economic bounds. Selection of a material necessitates a knowledge of mechanical properties as obtained in conventional tests, however, strict interpretation of test data can contribute to misunderstanding and misapplication since the part in service is generally in a stress state which is not amenable to laboratory tests. The tensile test provides a graphic picture of the strength of a material in resisting tensile deformation; however, in service, most parts are not stressed in axial tension but may, for example, be highly stressed at the surface by bending or torsion. Although the stress state of simple shapes is amenable to calculation, this becomes progressively more difficult and uncertain with complexity of the part and of the active stresses.

Although stress raisers are of minor significance in static load applications, they play a major role in dynamic applications. Results of fatigue tests on laboratory specimens may not be representative of the part in service where stress raisers are often present.

The ductility and reduction in area as measured in the tensile test are not a complete measure of a material's toughness nor are impact test properties always reliable. A more realistic criterion is the relationship between the energy absorbed, as measured by impact, and temperature. Depending on the temperature, failure may be by brittle or ductile fracture and the temperature at which a definite change in energy absorption occurs is designated the transition temperature. The transition temperature is not a fixed value for a given material but can be altered in a number of ways depending on processing and service conditions.

In many applications wear resistance is an important property and although hardness is generally a good criterion of wear resistance, especially abrasion, it tells little or nothing in regard to such factors as corrosion, lubrication or stress misalignment.

The materials engineer can, in many instances, purchase material with the required characteristics or he can alter the properties in making the part or in subsequent processing. The introduction of a desired amount of cold work in forming the part is one method although the most widely used technique by far is heat treatment. With steels a compromise in heat treatment is necessary to provide high hardness and good ductility.

Together with stress raisers, the other obstacle to be overcome in achieving satisfactory service performance is improper processing and application. The difficulty of measuring and analyzing residual stresses makes it difficult to evaluate the contribution of these stresses in the success or failure of the part. Compressive surface stresses can be induced by the volume change accompanying surface hardening and a number of methods to both work the surface and reduce stress raisers are used. Processing which requires plastic deformation of the part can be performed to orient the grains and flow the metal so that service load and orientation are optimum.

The materials engineer is a key man in the designer-metallurgist-materials engineer team and only by proper use of properties, processing and application can he meet the requirements of cost and service performance.—**Reported by M. A. Molnar for Saginaw Valley Chapter.**

OBITUARIES

DANA DEMOREST, retired professor of metallurgy, Ohio State University, died early in July at the age of 75. Prof. Demorest joined the University staff in 1908, a year after his graduation with a B.S. degree in chemical engineering. He was chairman of the department of metallurgy from 1915 until 1948, and remained in a teaching capacity until his retirement in 1952. Prof. Demorest was a Life Member of the American Society for Metals.

♦ ♦ ♦

ROY C. MCKENNA, Chairman of the board, Vanadium-Alloys Steel Co., passed away on July 12. Mr. McKenna, A.S.M. Medal for the Advancement of Research recipient in 1957, was featured in the cover story, *Metals Review*, January issue.

♦ ♦ ♦

JOSEPH B. BRENNAN, long a member of the Cleveland Chapter, died on June 13. From 1930 to 1937 he was factory superintendent for Magnavox Corp., Ft. Wayne, Ind. A "graduate" of Edison's laboratories in East Orange, N. J., in 1921, he spent his time (other than with Magnavox) in developing inventors' ideas into commercial processes, principally for the electronics industry. He had a research laboratory in Cleveland, a pilot plant in Columbia City, Ind.

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OTTO L. LEHECKA, sales representative for 18 years in the Cleveland district for Braeburn Alloy Steel Corp., died late in April.

♦ ♦ ♦

G. F. HUTTIG, president of the International Plansee Society for Powder Metallurgy, Reutte/Tyrol, Austria, died late in 1957.

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ROLLA E. POLLARD, a member of the Washington Chapter for many years, and a metallurgist with the National Bureau of Standards, died on May 22 at the age of 60. Mr. Pollard worked and published papers in the fields of powder metallurgy, surface protection of metals, residual stresses and stress corrosion.

A.S.M. prepares and distributes, on request, preprints of the technical and scientific articles presented at the annual convention.

Educational Report From Washington, D. C.

What can the local technical society do to stimulate an interest in metallurgy in high-school students?

Metallurgy is rarely taught as a high-school subject. Courses in chemistry and physics at this level give little or no attention to metals and alloys as structural materials, nor to their special metallic properties.

Nevertheless, many of our high-school students are abundantly qualified, by intelligence, by potential interest and by general education in scientific principles, to do well in pursuing metallurgical study in high school. Others, going directly from high school into metal fabrication jobs, would find a brief but accurate explanation of the properties of metals extremely useful as bread-and-butter information. Both the outstanding, academically inclined student and the early breadwinner could profit abundantly from moderately brief exposure to basic metallurgical training. The professional society of metallurgists has a responsibility to encourage the local provision of such training. This article describes one way in which this has been done.

Recently this author had the privilege of helping to judge a national contest of high-school and elementary school students as to excellence in conducting independent study in metallurgy and reporting on this study. Many of the reports would have done credit to college or even graduate school level. To be sure, many of the winners and outstanding competitors owed much to parental stimulation and encouragement. The home is often the first laboratory. Most parents who are technically or professionally trained are properly reluctant to force-feed their children the specialized knowledge of their own professions, or to over-persuade their children to follow in their own footsteps. But the wise parent has found it possible to steer a middle course: stimulating in the child a general interest, supported by good general background in the sciences. A child so brought up is free to follow his own interest, with a valuable home training to support it.

In the summer of 1957 the educational committee of the Washington Chapter held a series of meetings to consider what a local professional society could do to stimulate this interest in high-school students. Our first decision was whether to charge for the course. As a matter of policy we prefer to set a value on courses given by the Chapter but for this course we decided to charge no fee. This first venture into education at the high-school level would be an experiment and to charge admission would be asking the students to buy a pig in a poke. Even for future courses it is doubtful that a fee should be charged: by considering it a public service enterprise from which the A.S.M. will gain friends and membership at a later date, we believe we can justify the courses on an open basis.

The subject matter, it was agreed, should hold strictly to metallurgy; to be divided roughly 60-40 between physical and extractive metallurgy.

We hoped to hold the lecture series in the auditorium of a centrally located public high school but found this infeasible, so we gratefully accepted an offer from Georgetown University to use a large classroom on the campus.

How long will a high-school student sit still and listen to metallurgical discussions? We didn't know, but we decided to assume that if we could command their interest at all, high-school students could hold out as well as anybody. Two hours was set aside for each lecture, and we were not disappointed. The kids stayed to the end of the lectures and then lingered to ask questions.

The scope of this first lecture course is shown by the subjects covered: extractive metallurgy, nonferrous metal refining and fabrication, making and shaping of steel, physical metallurgy and metals of the future. With each lecture we presented educational movies, provided mostly by our friends in industry, with a few government-produced films.

In the back of the lecture hall we set up a table and placed on it brochures and pamphlets of an educational nature, supplied mostly by industrial concerns and technical or trade associations. This proved to be a very popular and well-patronized feature of the lectures. A.S.M. literature on metallurgical careers and opportunities for study were of course made available, especially at the concluding session.

Lining up the speakers presented no problems. Everyone who was invited to participate accepted the philosophy of the course without coaxing; most were eager to help.

An examination of the attendance records shows that about 100 students appeared at each of the six sessions. More than 30 attended every session. Nearly two-thirds of those who attended all the lectures (and about half of the total attendance) were apprentices or junior-level technicians in industry. A few were translators of foreign metallurgical literature who took this opportunity to obtain a linguistic familiarity with the subject with which they were concerned professionally. The remainder, nearly half, were science students from local high schools, accompanied by a few science teachers.

This first lecture series was not very intensively publicized. We relied principally on word-of-mouth publicity sparked by members of the Washington Chapter, although we did send copies of the brochure to all the local high schools. Local radio and TV managements are always receptive to news about something new and different, but more personal contact with each local high school is highly desirable. Newspaper publicity, while at something of a premium in this area, is still a possibility. News in the high-school paper is an excellent direct contact. A personal note to the president or adviser of the high-school science club will reach a selected audience. Other such contacts will occur to the reader.

Are there perhaps some recommendations that we could pass on to other A.S.M. members and to the national officers and staff of A.S.M.? Indeed yes.

First of all, the type of course here proposed needs a good concise pamphlet of not more than 48 pages to present and explain in simple lay language the most basic and universal principles of metallurgy and to show the applicability of these principles in familiar situations.

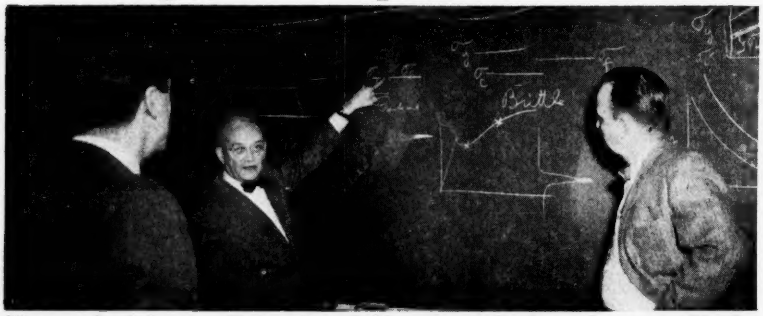
Secondly, it would stimulate a great deal of interest in metals if a short and simple laboratory manual in metallurgy could be prepared, containing information on equipment reasonably available for use in the penny-pinching high-school laboratory, suggestions on specific educational experiments in metallurgy and how to perform them, and ideas for independent research by students wishing to go beyond routine experiments.

Thirdly, it would be helpful to have available a short glossary of metals and metallurgical terms in pamphlet form. Also bibliography of trade literature available for distribution would be very useful.

To the skeptic there may be a "do-gooder" flavor about all this free education of the young and uninformed. Perhaps so, but it is the sort of social activity that has a good deal in its favor. It will educate people who never will be metallurgists to understand and appreciate some of the basic principles of metallurgy and to respect this new academic discipline. It will excite the interest of some able youngsters and thereby strengthen the profession and enlarge its accomplishments. To those who enjoy coaching and working with youngsters it affords a pleasant and constructive opportunity to address a very select audience of intellectually alert, eager and well-informed kids who are going places. And last—and most important—it is a strictly volunteer effort on all sides, without direction or dictation, but completely free in the best tradition of a free country. — **Reported by F. P. Huddle for Washington.**

A.S.M. created the Annual Teaching Award in Metallurgy, open to teachers of metallurgy in the United States and Canada. Value $2000.

Visiting Lecturer Speaks at Minnesota



Thomas L. Johnston, University of Minnesota (Back to Camera), Charles S. Barrett, University of Chicago, Visiting Lecturer, and M. E. Nicholson, University of Minnesota, Shown at One of Dr. Barrett's Lectures

Speaker: C. S. Barrett
University of Chicago

Charles S. Barrett, professor, Institute for the Study of Metals, University of Chicago, spoke as a visiting lecturer on "Mechanical Metallurgy at Low Temperatures" and "Transformations in Metals and Alloys at Low Temperatures" at **Minnesota Chapter.**

Dr. Barrett's first lecture was a practical explanation of brittle fracture and he gave some pertinent examples of that type of failure in ship structures. He covered research that has taken place in this country and in Europe to overcome brittle fractures by lowering of the critical temperature. In the United States, this is done primarily by controlling chemistry—carbon, phosphorus and large grains will raise the critical temperature, whereas manganese, silicon up to 0.2% and grain refinement will lower the critical embrittling temperature.

He mentioned a very simple and sensitive test developed by the Naval Research Laboratory for determining the brittle fracture temperature. It consists basically of laying a carbide weld bead on the bottom side of a test plate and fracturing the weld bead under load from the top side. Depending upon load and temperature, the crack in the weld bead will or will not propagate through the base metal. By correlating test data the critical temperature can be determined.

The second lecture dealt with the theory of brittle failure and the transformation of metals and alloys at low temperature. — **Reported by Paul B. Wallace for Minnesota.**

Southern Metals Conference Covers Metal Fabrication

The 1958 Southern Metals Conference was held in Gatlinburg, Tenn., with Oak Ridge Chapter acting as host to the 11 southeastern chapters A.S.M. sponsoring the meeting. Eight invited papers on metal fabrication were presented and other talks included a report on his trip to Russia by N. J. Grant, "Development of the Resources of Canada" by A.S.M. President G. M. Young, and "Development of Controlled Thermonuclear Reactors", by Albert Simon of Oak Ridge National Laboratory. The last day of the meeting was devoted to a tour of the Oak Ridge Laboratory. Reports of some of the papers are given below. Reports on the talks dealing with sheet metal working appeared in the August issue of *Metal Progress.*

S. E. Doughty, Carpenter Steel Co., discussed "Production and Fabrication of Stainless Steel, Titanium and Zirconium Tubing". The only essential difference in the treatment of titanium, zirconium and stainless steel is the welding techniques. One of the handicaps in the production of titanium tubing is the need for alloys having better welding characteristics.

In general, welded tubing is equal to seamless tubing, and because of the piercing problems associated with the production of seamless tubing, there are obvious advantages to welded tubing from the fabricator's viewpoint. Some of these difficulties may be overcome by the relatively new process of extruding seamless tubing.

John Preston, Austenal, Inc., discussed "Application, Production Control and Advances in Investment Castings". Among the advantages of investment castings are the ability to make parts of quite intricate design, close tolerances, good surface finish and the lack of directional properties as compared to sand castings. A major advance in the industry has been the introduction of vacuum melting. When melting, pouring and subsequent heat treatments are carried out in a vacuum, marked improvements are noted in the stress-rupture properties of a number of high-temperature alloys. These techniques also give control over inclusion content, interstitial content and grain size.

The spiral-point drill uses a different point geometry to bring the cutting edge of twist drills closer to the center of the drill. As a result of shifting the cutting edge, about 5% less torque and 25% less thrust are required for a given operation. There is a self-centering action which eliminates walking and the need for center punch marks, even on curved surfaces.

Considerable interest was shown in his description of electrodischarge machining. This method maintains a 0.001-in. gap between the tool and workpiece which are immersed in a liquid. An electrical discharge (10,000 discharges per sec.) removes metal from the surface of the tool and work. Thus far, practically all kinds of machining operations have been done by this method. The hardness of the material being machined is of no consequence and no distortions are introduced. It has been possible to machine honeycomb structures into complex shapes. The major disadvantages of electrodischarge machining are tool wear and its slowness. The rate of metal removal is of the order of that achieved in ultrasonic machining techniques.

J. H. Coobs, Oak Ridge National Laboratory, reviewed the "Solution by Powder Metallurgy of Some Unique Fabrication Problems Encountered in Nuclear Reactor Development". He outlined the characteristics of various reactor components and noted instances where powder metallurgy techniques are particularly suited. He also discussed the mechanism of bonding, the effect of pressure, size and shape of powder particles on bond strength, and the effect of sintering time and temperature on strength and density of compacts.

Specific examples of reactor components made by powder metallurgy included control rods and fuel elements fabricated by extrusion cladding. Nuclear poisons for control rods have been uniformly dispersed in composite three-ply or five-ply extrusions using Inconel cladding and nickel-rare earth oxide cores.

Using the picture-frame method of roll-cladding, fuel elements having powdered cores have been produced. For example, the Geneva Conference Reactor fuel elements had UO_2-aluminum powder cores clad with aluminum, and the Army Power Package Reactor fuel elements have cores of UO_2-stainless steel powders clad with stainless steel.

The technique of hot pressing is useful in fabricating configurations to close tolerances, especially where the combination of materials involve cemented carbides. The application of this method was illustrated by the production of a shielding component. The design required a minimum density of 12.0 gm/cc., a maximum thermal conductivity of 0.1 cal/cm²-sec-deg. C. and the composite was to be brazed into place. A hot pressed compact of tungsten carbide and Hastelloy C powders was found to meet these design requirements.—**Reported by C. J. McHargue for Oak Ridge.**

Student Awarded Prize

Dan Medley, Sophomore Metallurgical Engineering Student at Texas Western College, El Paso, This Year's Winner of the A.S.M. Foundation Scholarship, Valued at $400, Is Pictured (Left) Receiving the Scholarship Plaque From J. C. Rintelen, Chairman of the College's Department of Mining and Metallurgy

Presents Life Membership

G. M. Young, National President A.S.M., Is Shown Presenting a Life Membership in the Society to Luther Witmer, Professor Emeritus, Lafayette College, at a Meeting of the Lehigh Valley Chapter. On the right is L. J. McGeady, Chapter chairman. About 100 high-school students were guests at the meeting

Canton—Massillon Chapter Holds Panel on Corrosion

A panel discussion on "Corrosion" was held by the **Canton-Massillon Chapter,** with Ford Brandon, field metallurgist, Union Drawn Division, Republic Steel Corp., acting as moderator. Speakers were Mars Fontana, Ohio State University, Frank LaQue, International Nickel Co., G. M. Riegel, Republic Steel Corp., and P. P. Skule, East Ohio Gas Co.

Mr. Skule covered the field of pipeline corrosion, Dr. Fontana described new developments in metals for both strength and corrosion resistance, Dr. LaQue discussed stress corrosion, and Mr. Riegel developed the subject of carbide precipitation in stainless steels.

The East Ohio Gas Co. has 11,000 miles of pipe to care for, the 30-in. pipe being valued at $9 per foot. The most common types of pipe corrosion are electrochemical, stray electric current, direct current (both of the latter originate from mines and mine runs), elevated temperature at compressor stations and microbiological. Electrochemical corrosion, the most common type, results when the pipe becomes anodic to soil which acts as electrolyte.

Modern corrosion controls are built into the pipe in three basic forms—coating, metallic separation and cathodic protection. In the latter, the pipe is made negative to earth by a few 1/10's of a volt by placing magnesium, the anode, in ground beds to form a cell with the help of small amperage. Humorously, the guiding principal in East Ohio's cathodic protection is to eliminate the positive and accentuate the negative.

In the field of high-strength corrosion resistant properties, it was pointed out that many precipitation hardening alloys lose corrosion resistance. One, however, developed at Ohio State University (26 Cr, 5.5 Ni, 2 Mo, 3 Cu, 0.03 C) is claimed to be as good as 18-8 stainless.

Zirconium has proved resistance in atomic energy service to nuclear bromine solutions and is good in "hot" water and hydrochloric acid. Titanium is finding increasing use in the commercial field, since it is particularly resistant to nitric acid solutions, sea water and bleach solutions.

Under the topic of stress corrosion, it was stated that the chloride ion is powerful in its effect. In regard to environment, submerged articles will not crack in the absence of oxygen. No stress level is safe. Very dilute solutions can become concentrated under cyclic wetting, and cracks may develop where there is a source of heat, such as steam blanketing. All 300 series stainless steels are susceptible, Type 316 not excepted. Information was quoted that both nitrogen and carbon were regarded as bad actors.

Combatting corrosion in off-shore oil well construction was illustrated with colored slides by Dr. Fontana. Methods of protection from mudline to areas above sea water splash were discussed.

Results of carbide precipitation from welding in the stainless 300 series were discussed by Mr. Riegel. Means of preventing this included extra low carbon, use of carbide stabilizers Ti and Cb, and full anneal.

Dr. LaQue summed up the picture of corrosion prevention by stating that there is usually no trouble with high rates of corrosion resulting from materials applied. The bulk of applications are good. It is the unusual case or misuse of material in which trouble occurs. He expressed opposition to solving corrosion cases on the basis of environment charts or material rating tables. If the problem is important, a specialist who can work with the staff of both the user and the supplier should be called in.—**Reported by G. L. Perkins for Canton-Massillon.**

Economics of Atomic Fuel Are Reviewed at Hartford

Speaker: John Frye

Oak Ridge National Laboratory

"Economics of Power From Atomic Reactors" was the title of the talk given by John Frye, Oak Ridge National Laboratory, at a meeting of the **Hartford Chapter.**

Mr. Frye described the three types of reactors—solid fuel, liquid fuel and high-temperature salt, and mentioned that of the three, only the solid fuel type is economically feasible.

John Frye

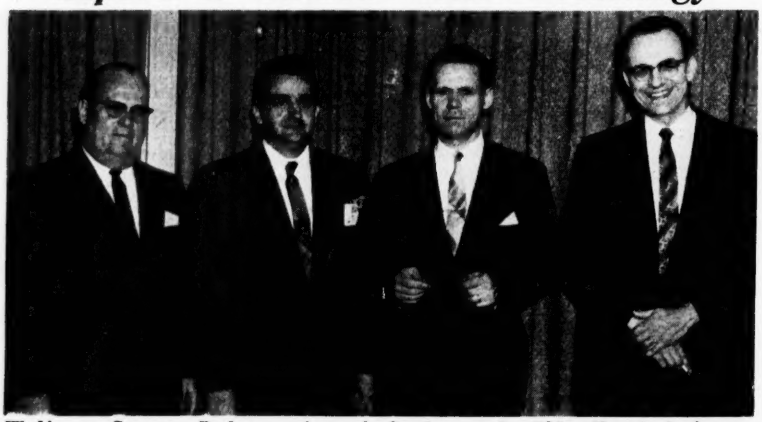
At the present-day price of materials, using an atomic reactor to generate power is not economical. However, for defense purposes, it could be very valuable for use in remote places where it would be difficult to transport large supplies of ordinary fuel.

Atomically generated power has another potential use in countries such as England where the natural fuel supply is running out and the cost of importing fuel would be greater than using atomic energy.—**Reported by D. W. Rockwell for Hartford Chapter.**

Nitriding of Steel Worcester Topic

Present at a Meeting of the Worcester Chapter Were, From Left: F. E. Kennedy, Technical Chairman; Michael J. Bever, Professor of Metallurgy, Massachusetts Institute of Technology, Who Spoke on "Nitriding and Carbonitriding of Steel"; Walter J. Nartowt, Chairman; and Leonard L. Krasnow, Vice-Chairman. (Reported by C. Weston Russell for Worcester)

Reports on Guided Missile Metallurgy



Wolfgang Steurer, Redstone Arsenal, Spoke on the "Metallurgical Aspects of Guided Missiles" at a Meeting of Canton-Massillon Chapter. Shown at the meeting are, from left: G. Brainard Trumble, chairman; Frank Fazzalari, technical chairman; Dr. Steurer; and W. W. Scheel, vice-chairman

New Haven Members Tour Silver Plant

Members of the New Haven Chapter Visited the International Silver Co., Meriden, Conn., Recently. Walter Morris, manager of the design division, talked on "Art in Metals". Shown, from left: Mr. Morris; Harold O. Seeley, chairman; and Calvin R. Brown, technical chairman of the meeting

MEN OF METAL

JOHN F. KLOSKEY has been appointed eastern representative for Precision Extrusions and will cover the greater Philadelphia area.

EDWARD M. MEYER, former Chicago district sales manager, has been appointed assistant manager of western sales for Bliss & Laughlin, Inc.

T. PIERCE HUNTER has been appointed manager of advertising and public relations for The Budd Co.

PAUL W. BEAMER is now manager of sales and development for the Utica Metals Division of Kelsey-Hayes Co. He comes from Austenal Inc., where he was manager of metallurgical development and research.

FRED A. KAUFMAN, formerly with the McKay Co., has been elected a vice-president and general manager of the new Refractomet Division, Universal-Cyclops Steel Corp.

Alloy Precision Castings Co. has appointed DAVID BROWN, formerly procurement inspector at Republic Aviation Co., chief inspector, and has promoted EDWARD C. KINNAMAN, quality control manager, to production manager.

NELSON MCROBERTS has been appointed district representative for Hevi-Duty Electric Co., with headquarters in Detroit.

ADOLPH E. PALTY, formerly with the Thomson Laboratory of General Electric Co., and KUANG LU CHENG, with Westinghouse Materials Engineering Department, are now supervisor, alloy development and evaluation, and associate director of research, respectively, for Utica Metals Division of Kelsey-Hayes Co.

JOHN G. CUMMING has been appointed Southwestern Division manager for A.M. Byers Co., with headquarters in Houston.

A. D. BLAKE, sales engineer, spectrochemical equipment, Baird-Atomic, Inc., has been assigned to handle the Chicago area.

JOHN W. HOLSWARTH has been made manager of the Western District office of the Electric Furnace Co., Santa Ana, Calif.

Aims of Research Topic at Wyzalek Night

The John Wyzalek Memorial Award Winners Were the Guests of the New Jersey Chapter During a Meeting at Which George R. Seidel, E. I. du Pont de Nemours & Co., Spoke on "Research and You". The Wyzalek Awards are given annually by the Chapter to encourage the study of metallurgy in New Jersey's vocational and technical high schools and the talk was aimed at the interests of the young guests present

Speaker: G. R. Seidel

E. I. du Pont de Nemours & Co.

At the John Wyzalek Memorial Award Night, the **New Jersey Chapter,** in keeping with the awards given annually to encourage the study of metallurgy in New Jersey's vocational and technical high schools, featured a lecture entitled "Research and You" aimed at the interests of the young guests present. George R. Seidel, eastern district manager of Du Pont's Extension Division, emphasized that the United States, through research and associated industrial activity, has found the key to successful living, in contrast to more than 100 countries and civilizations that sought for it in vain. However, we can lose it if we do not safeguard the principles and ideals upon which our nation was built.

A high standard of living doesn't just happen. It must be made to happen, and this job is done to an important degree by American industry because men with economic and political freedom have the incentive to carry it through. Our industrial system, which turns out the products for our high standard of living, also provides indirectly the leisure and the means for spiritual and cultural growth. These byproducts have enabled us to lead the world in libraries, art museums, hospital beds, parks and playgrounds, public support of charitable and community ventures and church activity.

America was likened to a table of plenty whose four legs are home, school, factory and church. And in another analogy Dr. Seidel encouraged the young people to always give a little more than was expected or asked of them and thereby become a contributing member of the winning team America is putting on the field of human endeavor.—**Reported by Stanley W. Sokolowski for New Jersey.**

Three Speakers Wind Up Detroit Corrosion Series

The third lecture in the series, "Corrosion of Metals" presented by **Detroit** had as its theme "Corrosion Problems Encountered by Automobiles". The subject was covered by three speakers each of whom discussed specific phases of corrosion problems and their solutions.

The first speaker, Carl O. Durbin, materials engineer, Chrysler Corp., covered "Materials and Design Factors". Since automobiles now operate in all extremes of climatic conditions and environments, the corrosion problems encountered vary from light tarnish to severe corroding away of parts. The development of a very thin film of corrosion product on an electrical contactor can be more serious to the operation of a car than severe corrosion of some other part. The selection of materials for automobiles is primarily based on economics. To specify materials which, under all circumstances, would completely resist corrosion for all environments would result in a manifold increase in the cost of the product. A compromise in design and material selection is made to give satisfactory performance under average conditions and life expectancy.

The second speaker, Joseph Gurski, manager of chemical and metallurgical laboratory service department, Ford Motor Co., covered "Types of Protective Coatings Used in the Automobile". In dealing with protective coatings, the present-day manufacturer utilizes practically all known methods and coating materials, and is continually developing new methods and coatings which are demanded for satisfactory performance.

Protective coatings divide themselves into two main categories: those having a primary function of appearance (decorative or aesthetic) and those whose primary function is to insure satisfactory operation of the car. Economy is an important consideration in selecting the type, method and material to be used for the protective coating.

The third speaker, Leonard C. Rowe, senior research chemist, General Motors Corp., covered "Corrosion Testing Methods". In corrosion testing of automotive parts, the laboratory endeavors to develop accelerated test programs which will be indicative of the conditions that part will be subjected to in service over periods of years. Many corrosion tests have been developed which are unique for evaluating automotive service. The corrosion tests conducted in the laboratory are then correlated with field test results, and finally to service results.—**Reported by H. Semchyshen for Detroit.**

As an indication of the tremendous dissemination of engineering information, a compilation shows that in one year the A.S.M. collected, edited, published and distributed over ***one hundred million pages*** **of metallurgical information.**

A.S.M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad Received During the Past Month

Prepared at the Center for Documentation and Communication Research. Western Reserve University, Cleveland. With the Cooperation of the John Crerar Library, Chicago.

A General Metallurgy

516-A.* New Engineering Metals. J. P. Denny and L. F. Kendall. *Mechanical Engineering,* v. 80, Aug. 1958, p. 67-71.

Availability, properties, prices of zirconium, hafnium, vanadium, columbium, tantalum, chromium and rhenium. (A-general; Cr, Cb, Hf, Ta, V, Zr, Rh)

517-A. Development of ZM41 Magnesium Sheet Alloy. H. A. Johnson and R. D. Masteller. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131417, Sept. 1957, 29 p. $.75.

Magnesium alloy system was superior to AZ31 sheet alloy. Designated ZM41, the new alloy has a nominal composition of 4% Zn, 1.0% Mn, 0.7% mischmetal, balance Mg. ZM41 showed consistently better tensile properties than AZ31B, together with more uniform properties in the transverse and longitudinal directions. ZM41-mischmetal alloys displayed an increased resistance to corrosion compared to AZ31B. The new alloy can tolerate a greater amount of iron than AZ31B without seriously decreasing corrosion resistance. Mischmetal was found to increase the hot rollability of Mg-Zn alloys. (A-general; Mg, Zn)

518-A.* Why Should I Use Titanium? Paul M. Tyler. *Metal Progress,* v. 74, Aug. 1958, p. 110-114.

The inherent advantages of Ti and improvements achieved by alloying. Contrasted with these are some disadvantages largely reflected in difficulties in fabrication. The Sheet Rolling Program is one organized attack to solve some of the latter problems. (A-general, 17-57; Ti)

519-A.* (French.) **Manufacture and Properties of Spheroidal Graphite Cast Iron.** M. Eudier and L. Hallot. *Metaux-Corrosion-Industries,* v. 33, May 1958, p. 212-227.

Composition of starting material and effects of various elements on structure and properties of SG iron; use of basic and acid cupolas; Mg alloys used in treating molten metal; methods of introducing Mg into bath and into ladle; mechanical properties of specimens and parts in SG iron; heat treatment of SG irons. (A-general; CI-r)

520-A.* Centrifugal Castings. Pt. 1. Ferrous Metals. John L. Everhart. *Materials in Design Engineering,* v. 48, Aug. 1958, p. 89-93.

Advantages and disadvantages of centrifugal castings of carbon steels, alloy steels, stainless steels and gray iron. Applications and typical properties tabulated. 8 ref. (A-general; 5-65, CN, AY, SS, CI)

521-A. Magnesium Alloys With High Melting Point Additions. R. R. Nash. Rensselaer Polytechnic Institute. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131198, Mar. 1957, 196 p. $5.

Determination of alloying characteristics, influence on microstructures, mechanical properties and corrosion resistance of additions of high melting point elements to Mg and Mg-base alloys. (A-general; Mg-b, AD-q)

522-A. How Can We Hurdle the "Materials Roadblock"? Irwin Stambler. *Aviation Age,* v. 30, Aug. 1958, p. 18-19, 93-97.

Research trends in high-temperature alloys. (A-general;SGA-h, 17-57)

523-A. Evaluation of the Blaw-Know —Ruthner Pilot Plant. J. H. Strassburger. *Blast Furnace and Steel Plant,* v. 46, June 1958, p. 587-594.

Process compares favorably with existing processes for recovery of usable H_2SO_4, HCl and FeO. (A8b, A9j)

524-A. Notes on the Geochemistry and Economic Concentration of Vanadium. D. R. Williamson. *Colorado School of Mines Mineral Industries Bulletin,* v. 1, July 1958, 16 p.

36 ref. (A11a, B-general; V)

525-A. New PERA Workshops. *Iron and Steel,* v. 31, July 1958, p. 365-368.

Research facilities and metal cutting and forming research at Melton Mowbray of Production Engineering Research Association of Great Britain. (A9h, G-general)

526-A. Wrought and Cast Magnesium-Thorium and Magnesium-Zirconium Alloys. *Materials in Design Engineering,* v. 48, July 1958, p. 121, 123.

Fabricating properties and corrosion resistance of wrought and cast Mg-Th and Mg-Zr alloys. Alloys include HM31X, HM21A-T8, HK31A, ZK60A-F, EZ33A, HZ32A, ZH62A and ZK51A. (A-general, P-general, Q-general, R-general; Mg, *Th, Zr)*

The subject coding at the end of the annotations refers to the ASM-SLA Metallurgical Literature Classification. International (Second) Edition, now available from A.S.M., 7301 Euclid Ave., Cleveland 3, Ohio.

527-A. Growth of the Titanium Industry. Paul M. Tyler. *Metal Progress,* v. 74, July 1958, p. 97-100, 170, 172, 174, 176.

At a cost of six years' time, $250,000,000 of the Government's money plus nearly $100,000,000 of private capital, a complete Ti industry has been established in America. (A11a; Ti)

528-A. Forecast of an Information Center. Majorie R. Hyslop. *Metal Progress,* v. 74, July 1958, p. 108-111.

The A.S.M.'s research project at Western Reserve University has progressed far enough to prove that penetrating searches of technical and scientific literature can be made electronically. The first commercial service will very likely be to send to individual subscribers information about documents appearing currently in any chosen portion of the metallurgical field. (A14e)

529-A. The Titanium Situation. Herbert H. Kellogg. Digest of "Present Status and Future of the Titanium Industry in the U. S." *Metal Progress,* v. 74, July 1958, p. 185-186. (From *Schweizer Archiv für Angewandte Wissenschaft und Technik,* Jan. 1958.)

Future Ti cost and production estimates. (A4; Ti)

530-A. Vacuum Melted Alloys. *Metal Progress,* v. 74, Aug. 1958, p. 96B-96D.

Data sheet indicating grade, composition, source and applications of vacuum-melted alloys from 17 manufacturers. (A-general, C5k, 1-73)

531-A. IRSID Opens Pilot-Plant Laboratories. *Metal Progress,* v. 74, Aug. 1958, p. 123-124.

New research station of the French Iron and Steel Research Institute (IRSID) equipped primarily to study iron ore and hot metal techniques, will operate on tonnage sufficient to extrapolate full-scale methods. (A9j, B-general, D-general; Fe, ST)

532-A. A Simulation of Melting Shop Operations by Means of a Computer. R. Neate and W. J. Dacey. *Process Control and Automation,* v. 5, July 1958, p. 264-271.

(A9n, X14; ST)

533-A. Planning and Operating an Industrial Waste Disposal Plant. G. J. O'Kane. *Products Finishing,* v. 22, Aug. 1958, p. 38-45.

Waste disposal plant installed as

part of the plating operations produces an almost colorless, clear effluent, free of detectable cyanides, cyanates, chromic acid or copper. (A8b, L17)

534-A. The Challenge of High Temperatures. F. D. Richardson. *Times Science Review (London),* no. 28, Summer 1958, p. 2.

High-temperature equipment and materials; refractories, future development. (A-general, 2-62; SGA-h)

535-A. Metallochemical Table of the Chemical Elements. I. I. Kornilov. *Academy of Sciences of the USSR, Proceedings,* v. 114, 1957, p. 449-452. (Translation by Consultants Bureau, Inc.)

Characteristics of the chemical reactions of metals with elements of the periodic system. Families of metals are shown capable of forming continuous solid solutions, limited solid solutions with metallic compounds, metallic compounds without solid solutions, compounds of an ionic type. 6 ref. (A-general, P10)

536-A. (French.) **Properties and Applications of Spheroidal Graphite Alloy Cast Irons.** J. Grilliat. *Metaux-Corrosion-Industries,* v. 33, May 1958, p. 228-242.

16 ref.
(A-general, Q-general, 17-57; CI-r)

537-A. (French.) **Canadian Aluminum Industry.** Michel C. Hugueney. *Revue de l'Aluminium,* v. 35, May 1958, p. 511-514.

Origins and growth of industry during and since World War II. (A2, A4; Al)

538-A. (German.) **Measurement of Gas Traces in the Ironworks.** Fritz Bangert. *Stahl und Eisen,* v. 78, May 29, 1958, p. 743-747.

Measurement of gas traces by means of a portable gas detection apparatus. Dust measurements with a diaphragm filter. Continuous and automatic measurement of carbon monoxide in combination with warning devices. (A8a, X7h, E-general)

539-A. (Portuguese.) **Brazilian Steel Industry Perspectives.** Joao G. Haenl. *Engenharia, Mineracao e Metalurgia,* v. 27, May 1958, p. 259-262.

(A-general; ST)

540-A.* PH Stainless Steels Beat the Heat. J. N. Barnett and W. W. Rohde. *Aeronautical Procurement,* Aug. 1958, p. 21, 41.

Properties, applications of PH 15-7 Mo, 17-7 PH, 17-4 PH steels. (A-general, Q-general, 17-57; SS, SGA-h)

541-A.* Iron and Phosphate Slag From Byproduct Ferrophosphorus. J. M. Potts, W. C. Scott, Jr., J. U. Campbell and J. A. Wilbanks. *Electrochemical Society, Journal,* v. 105, Mar. 1958, p. 148-151.

Process and furnace for converting byproduct ferrophosphorus into high-grade iron for metallurgical purposes and phosphatic slag that might be used as a fertilizer or animal-feed supplement. The process involves smelting ferrophosphorus, siliceous iron ore and burnt lime in an electric furnace. Refractory problem was solved through the use of a two-component furnace. 6 ref. (A11d, W17; Fe, RM-q)

542-A.* (Spanish.) **Steel Industry in the United States.** Enrique O. Monge. *Universidad Nacional de Ingenieria, Boletin,* v. 30, July-Sept. 1957, p. 3-34.

Survey of raw material consumption, processing, melting, rolling and other steel mill operations. Furnaces and rolling equipment and types of products turned out. (A-general, D-general, F23; ST)

543-A. Cobalt in High-Temperature Alloys, Special Report No. 1. F. R. Morral. *Battelle Memorial Institute,* 1958, 12 p.

Cobalt production, consumption and availability; properties of Co and Co alloys.
(A-general; Co, SGA-h)

544-A. Aspects of Russian Engineering Industry. *Machinery (London),* v. 93, Aug. 6, 1958, p. 286-300.

Russian machine tool facility at Sverdlov. (A-general, W25)

545-A. Development of Metal Ceramics. *Platinum Metals Review,* v. 2, Apr. 1958, p. 53-54.

(A-general; Pt, SGA-h, 6-70)

546-A. Composition of Beryllium Borides. L. Ya. Markovskii. *Doklady Akademii Nauk SSSR,* v. 101, no. 1, 1955, p. 97-98. (Henry Brutcher, Altadena, Calif., Translation no. 4091.)

(A-general; Be, B)

547-A. The Metallurgy of Boron Structural Steels. O. N. Meshcherinov. *Stal',* v. 18, no. 1, 1958, p. 75-81. (Henry Brutcher, Altadena, Calif., Translation no. 4256.)

Previously abstracted from original. See item 323-A, 1958.
(A-general; AY, *B*)

548-A. (French.) **New Ultra-Light Magnesium-Base Alloys.** *Genie Civil,* v. 135, June 1, 1958, p. 249-253.

(A-general; Mg-b)

549-A. (German.) **New Techniques for Selecting Employees in a Modern Cold Rolling Mill.** Werner Fuchs. *Stahl und Eisen,* v. 78, July 10, 1958, p. 974-977.

(A5, F23, 1-67; ST)

550-A. (Hungarian.) **Properties and Applications of Aluminum-Bronze Castings.** Gyula Emod. *Kohaszati Lapok-Ontode,* v. 91, Apr. 1958, p. 90-95.

6 ref. (A-general, Q-general, 17-57; *Al,* Cu-s, 5-60)

551-A. (Russian.) **Comparison of Metallurgical Progress Between U.S.A. and U.S.S.R.** V. A. Podzerko. *Metallurg,* v. 3, July 1958, p. 1-5.

(A-general)

552-A.* Regeneration of Waste Pickle Liquor to Produce Ferrous Sulfate Monohydrate. J. S. Atwood, J. S. Joseph and W. W. Hodge. *Engineering Bulletin, Twelfth Industrial Waste Conference, Proceedings,* no. 94, May 1957, p. 378-389.

Monohydrate process is cheapest method for handling over 10,000 gal. per day of waste acid. 7 ref. (A8b, L12g, NM-a31)

553-A. Iron - Chromium - Aluminum Alloys. J. E. Srawley. Naval Research Laboratory. *U. S. Office of Technical Services,* PB 131676, Apr. 1958, 19 p. $.50.

Alloys containing up to 25% Cr and 11% Al were produced by vacuum melting and hot worked by forging. When compared with Type 310 stainless steel, they were brittle at room and moderately high temperatures and weak above about 1200° F. Nevertheless, the alloys' oxidation resistance over-rode these disadvantages in some high-temperature applications, and tests showed that they are resistant to attack by combustion products of residual fuel oils. (A-general, Q-general, 2-62, R1h; Al, Cr, Fe, 4-51)

554-A.* (French.) **New Properties and Applications of Metals of Very High Purity.** G. Chaudron. *Revue de Metallurgie,* v. 55, May 1958, p. 407-416.

Purification of many common metals to the order of parts per million brings about many new physical properties. Results with Al and Fe include the appearance of polygonization and the competition between this phenomenon and recrystallization; high conductivity at low temperature; resistance to chemical attack and virtually complete suppression of certain diffusion phenonema. 21 ref.
(A-general, P-general, N-general, 3-69; Al-a, Fe-a)

555-A. (Rumanian.) **Thermo-Insulating Refractory Articles Made From Metallurgical Slag.** Al. Braniski, V. Siniansky and C. Cleper. *Studii si Cercetari Metalurgie,* no. 2, 1956, p. 369-377.

Laboratory investigations to determine possibility of utilizing porous, blast furnace slags in the manufacture of refractory thermo-insulating materials.
(A11d, D1, 17-57; RM-q)

556-A. (Chinese.) **A New Form of Commercial Material—Cast Iron With Spheroidal Graphite.** Chan I-Kwei. *Uli Tunbao,* no. 1, 1956, p. 9-15.

Survey of spheroidal-graphite cast iron, its production, properties and use. Tables list mechanical and physical properties and results of trials to determine tensile strength at high and low temperatures.
(A-general, CI-r)

557-A. Kaiser Steel Appropriates $214,000,000 to Expand Its Services to the Growing West. Charles Longenecker. *Blast Furnace and Steel Plant,* v. 46, Aug. 1958, p. 814-863.

Plant layout and equipment at Kaiser's Fontana, Calif., plant.
(A-general, W-general, 18-67; ST)

558-A. Kazakhstan—New Land of Soviet Metallurgy in Asia. R. Sewell. *British Steelmaker,* v. 24, July 1958, p. 212-213.

Steel production and resources of iron and other ores in Kazakhstan.
(A4p, A11a; Fe, ST, RM-n)

559-A. (French.) **Where Will the Belgian Steel Industry Obtain Iron Ore in the Future?** *Echo des Mines et de la Metallurgie,* no. 3516, May 1958, p. 287-288.

(A11a; Fe, RM-n)

560-A. (French.) **Contribution of Research on Corrosion and Protection of Metals to the Development of Modern Engineering.** Georges Chaudron. *Industrie Chimique Belgique,* v. 23, Apr. 1958, p. 355-365.

10 ref. (A9, L-general, R-general)

561-A. (German.) **Usefulness of Economy Studies in Foundry Work.** A. Herrmann. *Giesserei Praxis,* v. 14, July 25, 1958, p. 275-278.

(A4s, W19)

562-A. (German.) **Characteristics of Nonmagnetic Cast Iron Alloys.** Z. Tyszko. *Giesserei Praxis,* v. 14, July 25, 1958, p. 280-281.

(A-general, P-16, 2-60; CI, AD-n)

563-A.* (Czech.) **New Properties of Soviet Transformer Steels.** *Hutnicke Listy,* no. 3, 1956, p. 169-170.

Classification of transformer steels by Si content, magnetic properties, sheet thickness and rolling technology. Some new Soviet transformer steels compared to Czechoslovakian, German and American steels. (A-general; ST, SGA-n)

564-A. Manganese and Chrome Ore Outlook. John M. Warde and Eileen P. Burke. *Mining Engineering,* v. 10, Aug. 1958, p. 868-873.

(A11a; RM-n; Mn, Cr)

565-A. Beryllium Production Soars. *Steel,* v. 143, Aug. 8, 1958, p. 50-51.

(A4p; Be)

566-A. (French.) **Current Trends in the Steel Industry.** Rene Damien. *Industrie Nationale,* Apr-June 1958, p. 19-40.

(A4; ST)

567-A. (Hungarian.) **Notes About Aluminum-Titanium-Vanadium Alloys.** K. R. Vassel. *Kohaszati Lapok,* v. 11, no. 11-12, 1956, p. 522-528.

Properties of the alloys of Ti with V and Al. 10 ref.
(A-general, Q-general; Al, Ti, V)

568-A. (Russian.) **Titanium, Its Alloys and Field of Application.** N. T. Gudtsov and L. D. Mashyakova. *Vestnik Akademii Nauk SSSR,* no. 2, 1957, p. 59-68.

History of ores, production of the metal, mechanical and engineering properties, heat treatment of Ti alloys and their use in various branches of industry.
(A-general; Ti)

569-A. (Book.) **Radiation Effects on Materials. Vol. 2.** 140 p. 1958. American Society for Testing Materials, Special Technical Publication. STP 220, 1916 Race St., Philadelphia 3, Pa. $3.75.

(A-general; S19; 2-67)

570-A. (Book.) **German-English, English German Iron and Steel Dictionary.** 272 p. 1958. Verlag Stahleisen m.b.H., Breite Strasse 27, Dusseldorf, Germany. 12.50 Marks.

Contains more than 7000 words in metallurgical, mechanical and electrical practice.
(A-general; 11-67)

571-A. (Book—Dutch, French, English, Spanish.) **Metal Products From Holland.** 340 p. 1958. Association of Metal Working Industries. Nassaulaan 13, The Hague, Netherlands.

Guide to Dutch metal products includes list of manufacturers, classified and alphabetical indexes.
(A-general, 11-67)

B Ore and Raw Material Preparation

194-B.* (Italian.) **Influence of Composition of Mixes on Sintering Characteristics.** G. Sironi. *Metallurgia Italiana,* v. 50, May 1958, p. 181-190.

Study of sintering mixes based on magnetite and purple ore. A 50-50 mixture of these materials provided sinter of best strength and reducibility. Substitution of lignite for coke as fuel element impaired these characteristics. Self-fluxing sinters based on same 50-50 mix plus limestone additions gave about 10% less sinter product, as well as less satisfactory particle size and strength; however, reducibility was equal to that of product not containing limestone, and became appreciably higher as basicity was increased. Strength of self-fluxing sinter can be somewhat improved by adding rolling mill scale to sintering burden.
(B16a; Fe)

195-B.* (German.) **Pelletizing Iron Ores.** Georg von Struve. *Freiberger Forschungshefte,* B25, 1958, p. 38-52.

Experiments with different materials on their suitability for pelletizing. Pelletizing equipment and processes. Agglomerating additions and roasting where simple air drying doesn't provide the necessary pellet hardness. 15 ref. (B15, B16; Fe)

196-B. Investigation of Cuyuna Iron-Range Manganese Deposits, Crow Wing County, Minn. Walter E. Lewis, Leonard F. Heising, James W. Pennington and Charles Prasky. *U. S. Bureau of Mines, Report of Investigations 5400,* 1958 49 p.

(B-general; Mn)

197-B. On the Mechanism of Hardening of Iron-Ore Pellets. A. N. Pokhvisnev and B. A. Savel'ev. *Stal',* v. 18, 1958, p. 105-109. (Henry Brutcher, Altadena, Calif., Translation no. 4161.)

Previously abstracted from original. See item 104-B, 1958. (B16b; Fe)

198-B. Metallurgical Properties of Ore-Coke Pellets. G. V. Gubin. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk,* no. 6, June 1957, p. 32-36. (Henry Brutcher, Altadena, Calif., Translation no. 4198.)

Properties of pellets made without application of high temperatures and pressures, by catalyst-accelerated hardening in an atmosphere of carbon-dioxide-containing waste gases from industrial furnaces. Data on reducibility, softening temperature and mechanical strength.
(B16b; Fe, RM-n, RM-j43)

199-B. Mineralogic Make-Up of Fluxed Sinters. N. G. Moleva and P. S. Kusakin. *Stal',* v. 17, 1957, p. 1068-1071. (Henry Brutcher, Altadena, Calif., Translation no. 4142.)

Effect of silica content on nature and proportions of mineral constituents; data on sinters containing 12-16%, 10-15% and about 7% silica. Crystallization of calcium ferrites. Relative strength of fluxed sinters and underlying causes; nature of cement in various sinters; effect of rate of cooling on sinter strength.
(B16a; Si, Fe)

200-B.* (Russian.) **Use of Pyrite Cinder for Production of Fluxed Agglomerates of Higher Basicity.** L. Ya. Levin, N. M. Yakubtsiner and V. M. Sholenikov. *Metallurg,* v. 3, June 1958, p. 5-10.

Advantages of this method of sintering are: substantial reduction of sulphur content; increase in carbon content in charge from 3.5 to 4.8% by introduction of 25% cinder; improved gas penetration of sinter charge. (B16a, D1a; Fe)

201-B. (Russian.) **Mechanization of Preparation of Powder Material for Electro-Steel Smelting.** A. I. Sapko, V. P. Dobrov and V. D. Kucherov. *Metallurg,* v. 3, June 1958, p. 20-22.

(B16, 18-74)

202-B. (Russian.) **X-ray Studies of Phase Changes of Metal Agglomerates.** A. G. Slabchenko. *Zavodskaya Laboratoriya,* v. 24, May 1958, p. 579-582.

The agglomerate consisted of Fe_3O_4, Fe_2O_3, SiO_2 quartz and CaO. Increase of combustibles by 5% leads to formation of fayalites and to eutectoid fusion of the oxides.
(B16, N9; Fe)

203-B.* (German.) **Dimensions of Flotation Cells: Effects of Dispersion and Suspension.** Werner Gruder. *Zeitschrift fur Erzbergbau und Metallhuttenwesen,* v. 11, July 1958, p. 310-319.

Flotation depends on aeration. The stirrer produces suspension by agitating the mixture and dispersion by mixing with air. The height of the flotation cell has no influence on the yield, which depends only on the aeration. The agitation increases not only with the speed of the stirrer, but is also determined by the ratio of diameter of stirrer to width of cell. (B14h)

204-B. New Process, New Plant—High Grade Iron From Inco's Concentrates. *Mining Engineering,* v. 10, Aug. 1958, p. 864-866.

Process for recovering the iron content of nickeliferous pyrrhotite. (B15, C19n; Fe, Ni, RM-n)

205-B. (Russian.) **Mining and Preparations for Smelting of Minnesota Iron Ores.** S. M. Meleshkin. *Stal',* v. 18, July 1958, p. 593-598.

(B-general; Fe)

206-B.* (Russian.) **Properties of Fluxed Sinters.** N. L. Goldshtein and N. S. Khromchenko. *Stal',* v. 18, July 1958, p. 586-593.

Reducibility of sinter is determined mainly by temperature and thermal level of sintering process as well as by gang content in sinter blend. These factors may be defined by the share of bivalent iron in total iron content of sinter. The usual increase in reducibility of high basicity sinter is also explained by lowering of the temperature and thermal level of sintering process when using fluxed sinter blends. Conclusions are based on study of 100 samples of fluxed sinters with varying chemical composition. 18 ref. (B16a, D1; Fe)

207-B. The Oxidation of Powder Compacts of Copper-Iron Sulphides. T. A. Henderson. *Institution of Mining and Metallurgy, Transactions, Bulletin,* v. 67, 1957-58, p. 497-520.

8 ref. (B15; Cu, Fe)

208-B. Production of Pellets From Ore Concentrates and Ore Fines. F. M. Bazanov, F. F. Kolesanov, I. L. Maikin and S. I. Sharov. *Stal',* v. 18, no. 4, 1958, p. 289-294. (Henry Brutcher, Altadena, Calif., Translation no. 4233.)

Previously abstracted from original. See item 133-B, 1958.
(B16b; Fe, RM-n)

C Extraction and Refining

275-C.* **Production of Discaloy by Vacuum Arc Melting.** D. R. Carnahan. *Metal Progress,* v. 74, Aug. 1958, p. 100-102.

Discaloy is now being produced by the consumable-arc process. Problems solved during development of the commercial melting method.
(C5h, 1-73; SGA-h)

276-C. Vacuum Melting Today. *Metal Progress,* v. 74, Aug. 1958, p. 94-99.

Vacuum is being increasingly used in processing steels and superalloys for today's most stringent applications. Appreciable amounts of active elements can be added as alloying agents; gases and inclusions are reduced. The user has available a number of vacuum-produced alloys and more are in the offing.
(C25, C5, D8m, D9, 1-73)

277-C. On Vacuum Alloys. On Superheating of Alloys. D. S. Kamenetskaya. Paper from "Problems of Met-

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

allography and the Physics of Metals", *U.S. Atomic Energy Commission*, AEC-tr-2924, 1958, p. 39-41. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Substances can be melted in a vacuum which have a pressure at the triple point lower than the pressure corresponding to the given vacuum. Mg, Zn, Cd and Mn cannot be melted in a vacuum at a pressure equal to or lower than 10^{-2} mm. Hg. Al can not only be melted in a vacuum, but can be heated in a liquid state to considerable temperatures whereas Mg, Mn, Cd and other substances evaporate long before the melting temperature, corresponding to atmospheric pressure, is reached.
(C5, 1-73; Cd, Al, Mg, Mn)

278-C.* (French.) **Production of Calcium by Dissociation of Its Carbide.** Louis Hackspill and Nicole Platzer. *Comptes Rendus*, v. 246, May 28, 1958, p. 2969-2972.

Calcium carbide undergoes thermal dissociation under vacuum. Above 1500° C. the parting of metallic vapor is rapid enough to carry with it a large proportion of free carbon. This impurity can be separated by filtering the vapor through a porous graphite plate. The calcium can then be condensed and the resultant product has a free carbon content of less than 0.6%. 6 ref. (C27; Ca)

279-C. Uranium Milling Technology. S. W. F. Patching. *Mine and Quarry Engineering*, v. 24, Aug. 1958, p. 356-363.

Summary of papers on uranium process technology; concentrate specification; Dapex and Amex processing; ion exchange treatment of ore leach liquors; uraniferous lignite treatment; solvent leaching of U ore; stockpiling of nuclear fuel. (C-general; U)

280-C. The History of the Melting of Platinum. Donald McDonald. *Platinum Metals Review*, v. 2, Apr. 1958, p. 55-60.

(C5, A2; Pt)

281-C. (Czech.) **Production and Properties of Ag-CdO Pseudo-Alloy.** Vladimir Volejnik and Josef Bican. *Hutnicke Listy*, v. 13, 1958, p. 571-576.

Production of silver cadmium oxide pseudo-alloy by means of internal oxidation at various temperatures and with various Al-Cd alloys prepared by common foundry processes. Such alloy exhibited high microhardness of oxidized layer in a finer more regular distribution of cadmium oxide in base material than pseudo-alloys prepared by powder metallurgy.
(C-general, R2s; Cd, Ag)

282-C. (Rumanian.) **Manufacture of Lead-Sodium Alloys by Electrolysis of Sodium Hydroxide.** Al. Turassy and M. Fruchter. *Revista de Chimie*, v. 9, Apr. 1958, p. 203-206.

4 ref. (C23n; Pb, Na)

283-C. Chloride Volatilization of Oxidized Lead Ore From Eureka, Nev. A. L. Engel and H. J. Heinen. *U. S. Bureau of Mines, Report of Investigations 5409*, 1958, 7 p.

High extractions of Pb, Au and Ag resulted from treatment of an oxidized, arsenical refractory ore by chloride volatilization. The ore was roasted in an oxidizing atmosphere at 1000° C. for 1 hr. The chloridizing reagent was 300 lb. of $CaCl_2 \cdot 2H_2O$% ton of ore. 99% of the Pb, 98% of the Au, and 96% of the Ag, and only 6% of the As were volatilized. (C19r; Pb, Au, Ag)

284-C.* (French.) **Continuous Casting and Its Problems.** G. Wilz and M. Petitdidier. *Revue de Metallurgie*, v. 55, May 1958, p. 486-494.

Continuous casting installations of the world and their relative importance. The four-mold installation at Denain. Advantages of continuous casting and problems to be solved. A formula is established for calculating in advance the economic advantages attainable with such an installation. 34 ref.
(C5q, D9q)

285-C.* (Hungarian.) **Extraction of Contaminating Salts in the Bayer-Process and Utilization of Alkaline Salts.** Adam Juhasz. *Kohaszati Lapok*, v. 91, Apr. 1958, p. 161-168.

Removal of vanadium pentoxide, phosphorus pentoxide, sodium carbonate and caustic soda by leaching with lye. V_2O_5 and CaO are recovered. (C19n; Al)

286-C.* (Hungarian.) **Current Efficiency of Aluminum Reduction Plants.** Szakal Pal. *Kohaszati Lapok*, v. 91, Apr. 1958, p. 173-179.

Efficiency of modern furnaces is 85-90%. Each per cent improvement in efficiency increases the world product about 40,000 tons. Factors affecting efficiency are temperature, actual distance between the electrodes, current density, chemical composition of the electrolytes, physical and mechanical composition of the cathode and physical state of anode. 54 ref.
(C23n; Al)

287-C.* (French.) **Uranium Manufacturing Cycles.** Michel Brodsky. *Energie Nucleaire*, v. 2, Apr-June 1958, p. 110-115.

Steps in typical process used in France. Aspects of British, Belgian and U. S. processes.
(C-general; U)

288-C.* (Russian.) **Utilization of Low-Grade Manganese Ores for Production of Ferromanganese and Silicomanganese.** E. M. Alekseev. *Stal'*, v. 18, July 1958, p. 617-620.

It is technically possible and economically expedient to produce ferromanganese and silicomanganese from carbonaceous and low-grade oxide manganese ores in electric furnaces. Reserves of carbonaceous ores are in many regions three times as high as oxide ores.
(C21d; Mn, AD-n, Fe)

289-C. Causes of Difficult Stripping of Cathode Zinc Deposits. V. L. Klimenko. *Journal of Applied Chemistry of the USSR*, v. 30, 1957, p. 569-579. (Translation by Consultants Bureau, Inc.)

Difficult stripping in the industrial electrolysis of zinc sulphate solution refers to the abnormal increase of the force required to separate the cathodic Zn deposit from the Al cathodes owing to adhesion between them. (C23p; Zn)

D Iron and Steelmaking

406-D.* **Vacuum Pouring of Ingots for Heavy Forgings.** J. H. Stoll. *Blast Furnace and Steel Plant*, v. 46, June 1958, p. 595-605.

Bethlehem Steel's research in vacuum pouring of ingots results in a process which cuts down on hydrogen content and prevents flaking in steel. A 7-ton and two 250-ton vacuum degassing units, composed of a mold within a sealed chamber, were set up and pouring made and tested. Hydrogen content averaged 0.5 parts per million against 1.5 parts in air cast material. Ductility and cleanliness were superior in vacuum casting. Initial and operating costs are much higher and hazards greater but process has proved practical for higher quality steel.
(D9k, D9b, D9s, W19c, 1-73)

407-D.* **Kinetics of Slag-Metal Reactions.** T. B. King. *Royal College of Science and Technology, Metallurgical Club, Journal*, no. 10, 1957-1958, p. 35-40.

Principles of reaction kinetics applied to the removal of Mn, Si, C, S and H during steelmaking. Calculated rates of removal agree well with those obtained in practice. 4 ref. (D11n; ST, RM-q)

408-D.* (German.) **Relation Between Indirect Reduction and Consumption of Coke.** Anatol N. Pochwisnew. *Freiberger Forschungshefte*, B25, 1958, p. 5-18.

Reduction coefficients used previously are unsatisfactory for calculations. Two new coefficients are introduced, one representing the consumption of coke (p) and the other representing the reducing power of the gas (g). Both coefficients are easily determined by an analysis of the waste gases. With the coefficients p and g, graphs and conclusions on the economy of a furnace can be obtained. 18 ref. (D1, D11j)

409-D.* (German.) **Shape and Dimensions of the Combustion Zone in a Furnace.** I. P. Bardin, L. Z. Chodak and L. M. Zyljew. *Freiberger Forschungshefte*, B25, 1958, p. 19-37.

Studies with a laboratory experimental furnace. The combustion zone behind the tuyere has a spheroidal shape. Effect of changes in the blast-air quantity, the blast temperature, the blast pressure, the tuyere diameter and the size of coke, on the size of the combustion zone, on its reduction zones and on the reduction speed. 15 ref.
(D11j, W17g)

410-D.* (German.) **Use of Oxygen-Enriched Air Blast in the Fabrication of Spiegeleisen in Low-Shaft Furnaces.** Helmut Grohmann. *Freiberger Forschungshefte*, B25, 1958, p. 53-69.

A 25.5% O-enriched air blast proved to be profitable because the loss of unused heat and valuable gases was reduced. Of equal importance is the grain size of the coke and the charge. With a large grain size of 5 to 40 mm. and a coke grain of 20 to 40 mm., the reduction and yield were improved. 10 ref.
(D8p, D1a)

411-D.* (German.) **High Phosphorus and Sulphur-Bearing Charges in an Electric Arc Furnace, Using Pure Oxygen.** Karl-Friedrich Ludemann. *Freiberger Forschungshefte*, B26, 1958, p. 16-36.

This method provides a means of reducing melting time. After skimming the melted slag, dephosphorization takes place under a calcium phosphate slag poor in silicic acid. Pure oxygen supplied promotes desulphurization, oxidizing S to SO_2. The heat is completed under a slag similar to the openhearth slag. 20 ref. (D5d, D11s)

412-D. Ironmaking—Art or Science? H. A. Goldfein. *Blast Furnace and Steel Plant,* v. 46, June 1958, p. 611-614.

Operation of blast furnaces: quality of coke and limestone; handling of ore from unloading to furnace; temperature, humidity, pressure in operation of furnace; quality of slag. (D1b)

413-D. "Flocast" Method of Continuously Casting Iron Bar. H. E. Morris. *Foundry Trade Journal,* v. 105, July 3, 1958, p. 5-13.

Process brings increased dimensional accuracy, greater usefulness in bar automatics and general quality. (D9q, 1-52; CI, 4-55)

414-D. Steelmaking Progress in the U. S. Pt. 2. Use of Large Electric-Arc Furnaces. *Iron and Coal Trades Review,* v. 177, July 18, 1958, p. 143-146.

(D5)

415-D. For Refining Metals There's Nothing Better Than Vacuum. L. W. Johnson. *Product Engineering (Design Edition),* v. 29, Aug. 18, 1958, p. 72-74.

Current vacuum melting processes; advantages and disadvantages of each. (D8m, C25)

416-D. X-Ray Investigation of Cokes and Coals. A. M. Zubko and E. Z. Spektor. Paper from "Problems of Metallography and the Physics of Metals", U. S. Atomic Energy Commission. AEC-tr-2924, 1958, p. 32-38. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Structural changes in blast furnace coke as it moves from the charge hole to the burner and the tapping-hole regions: the coke in the charge hole has a lattice structure; as it moves from the charge hole to the bosh region the lattice structure is preserved and no signs of real graphitization are apparent. As the coke moves on to lower levels of the blast furnace it is graphitized, changing its physical and mechanical properties. 10 ref.
(D1, D11j; RM-j42, RM-j43)

417-D. Relation Between Desulfurization and Deoxidation of Steel. Z. Buzhek and A. M. Samarin. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk,* no. 9, Sept. 1957, p. 37-44. (Henry Brutcher, Altadena, Calif., Translation no. 4259.)

Effect of use of Al or Si added to the steel bath as deoxidizers (giving nongaseous deoxidation products) on rate of sulphur removal. Effect of desulphurization, after addition, of increase in temperature on rate of Si or Al. (D11s; *Si, Al,* ST, AD-r, AD-a)

418-D. Mechanism of Oxidation of Magnetite. V. I. Arkharov and B. S. Borisov. *Doklady Akademii Nauk SSSR,* v. 114, no. 2, 1957, p. 293-296. (Henry Brutcher, Altadena, Calif., Translation no. 4268.)

Lattice rearrangements at magnetite-hematite interfaces in iron scale during high-temperature oxidation and during such metallurgical processes as the reduction of hematite and the oxidation of magnetite. (D11r, M22g, M22h; RM-N, AD-s37)

419-D.* (Japanese.) Distribution of Oxygen in Molten Steel During Refining. Katumo Nagami, Minoru Koya and Yukio Nagano. *Sumitomo Metals,* v. 10, Jan. 1958, p. 1-4.

Samples taken from three doors of openhearth furnace show that oxygen content is influenced by iron direction. Sampling at middle door gave values near the mean for samples from the three doors.
(D11r, S12h; ST, *O*)

420-D.* Alternative Processes of Making Iron and Steel. A. G. Robiette. *Iron and Coal Trades Review,* v. 177, July 25, 1958, p. 209-216.

Operating principles of methods for making pig or sponge iron by means other than the blast furnace.
(D8; 10-54)

421-D.* (French.) Relation of Blast Furnace Process to Hydraulic Value of Slag. J. Roquejoffre. *Revue des Materiaux,* no. 512, May 1958, p. 119-135.

Grinding tests were conducted on 21 samples of granulated slag from blast furnaces charged with identical ore and producing basic pig of same quality. Reactivity of slag was found to be related to its density, with density depending on fineness after grinding. Second series of tests was conducted on 52 samples taken from same furnace and ground to same degree of fineness and relation between blast furnace process and hydraulic value of slag was investigated. Run-off temperature of slag determines initial reactivity, and run-off temperature, density and $CaO:SiO_2$ ratio are closely interdependent. Compressive strengths of cements made from these slags were conditioned by apparent density of slag and run-off temperature.
(D1g, D11n; CI-a, RM-q)

422-D.* (German.) Deoxidation of Molten Steel With Calcium Aluminide and Its Effect on Analysis, Structure, Yield and Quality. Kurt Fellcht. *Freiberger Forschungshefte,* no. B22, 1958, p. 9-113.

CaAl deoxidation of openhearth and electric steels. CaAl treatment of openhearth steels gives a fine-grained steel of slightly reduced hardness, strength and elastic limit. Both steels, when deoxidized with CaAl, show a 10% increased yield/tensile ratio, an increased necking and a higher notch-impact value along the rolling direction. The notch impact value across the rolling direction is lower for untreated steels. (D11r, Q6, Q23b, Q27d; ST-e, ST-f, AD-r 30)

423-D. Effect of Lithium on Certain Properties of an Austenitic Steel. R. P. Zaletaeva. *Metallovedenie i Obrabotka Metallov,* Sept. 1957, p. 25-27. (Henry Brutcher, Altadena, Calif., Translation no. 4262.)

Previously abstracted from original. See item 59-D 1958.
(D9s; ST, Li, AD-q)

424-D.* Reactions Between Iron Oxides and Alumina-Silica Refractories. Arnulf Muan. *American Ceramic Society Journal,* v. 41, Aug. 1, 1958, p. 275-286.

Increasing the wall thickness, within the limits studied, has a minor effect on cooling time of the metal; increasing the porosity increases the cooling time; use of a covering material has a marked effect on heat losses and slows cooling of the metal in the hot top. Equations to aid in the design of hot tops are derived. 8 ref (D9, W19c; RM-h36, Fe, Al, Si)

425-D.* Some Experiments With Steel Ingot "Hot Tops". M. E. Harnish and M. C. McQuarrie. *American Ceramic Society Bulletin,* v. 37, Aug. 1958, p. 357-360.

Small-scale model study of heat flow in the hot-top region. Effects of wall thickness, porosity and covering materials upon the cooling rate of the metal. 10 ref.
(D9p, W19c; ST, 9-68)

426-D.* (Swedish.) A Program-Controlled Reduction Test for Blast-Furnace Burdens. Rolf Linder. *Jernkontorets Annaler,* v. 142, no. 5, 1958, p. 246-266.

Reduction test carried out in barrel-shaped rotor laboratory furnace. Degree of oxidation after termination of test at 1000° C. indicates reducibility. Quantity of firing indicates disintegration during reduction. Satisfactory agreement was obtained between test and indirect reduction in blast furnace. 8 ref. (D1a, D11g, D11r; RM-n)

427-D.* (Hungarian.) Effect of Steam Injection on Blast Furnace Operation. Otto Farkas. *Kohaszati Lapok,* v. 91, Apr. 1958, p. 186-190.

Steam injection increases somewhat the amplitude of oxidizing zone, if in order to balance heat consumption of steam decomposition, temperature of blast steam is increased. Increase of moisture of blast injection changes composition of the air and that of gas formed in the blast. As a result of steam decomposition, oxygen and hydrogen contents of injection increase but nitrogen content decreases. Practically the entire quantity of hydrogen formed through decomposition of moisture takes part in reduction process and consequently the throat gas H_2 leaving the furnace increases little, and not in proportion to the humidity. Moisture content of blast may be increased to 30 g. per cu. m. without increasing the quantity of hydrogen in the raw iron. Higher humidity content of the blast stream results in decreased energy consumption. 11 ref. (D1h)

428-D. The Future of Oxygen in Steel. Eric Ford. *British Steelmaker,* v. 24, July 1958, p. 208-210.

(D10, D1h, D2g, D3f, D10; ST)

429-D. Distribution of Sulfur and Phosphorus Between Iron and Acid Slag. I. A. Tomilin and L. A. Shvartsman. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 418-423. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Equilibrium of the distribution of sulphur and phosphorus between liquid iron and a simple slag. Thermal effects of these processes. Sharp decrease of the distribution coefficients in comparison with the case of an iron slag is due to a change of the entropy term of the free energy. Hypothesis is advanced concerning the development of heat in the solvation of iron ions in the silicate slag. 7 ref.
(D11n; Fe, P, S)

430-D. A New Method for Studying Equilibria in the System Metal-Slag. V. F. Surov, O. V. Travin and L. S. Shvartsman. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 433-436. (Available from U. S.

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

Office of Technical Services, Washington 25, D. C.)

(D11n)

431-D. An Investigation of the Desulfurization of Cast Iron by Soda. O. V. Travin and L. A Shvartsman. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 424-432. (Available from U. S. Office of Technical Services, Washington 25, D. C.; also available from Henry Brutcher, Altadena, Calif., Translation no. 3865.)

Previously abstracted from original. See item 128-D, 1957.
(D11s; Fe, AD-a)

432-D. Influence of Oxides of Alkaline Earth Metals on the Distribution of Sulfur Between Iron and Iron Slag. L. A. Shvartsman, I. A. Tomilin, O. V. Travin and I. A. Popov. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 405-417. (Available from U. S. Office of Technical Services, Washington 25, D. C.; also available from Henry Brutcher, Altadena, Calif., Translation no. 4001.)

Previously abstracted from original. See item 226-D, 1957.
(D11n, 2-60; Fe, RM-q)

433-D. Use of Radioactive Isotopes in Studying the Kinetics of Scrap Melting and Slag Formation in the Scrap-Ore Process. A. I. Osipov, L. A. Shvartsman, V. I. Alekseev, V. F. Surov, M. L. Sazonov, M. T. Bulskii, S. A. Telesov, A. M. Skrebtsov, A. M. Ofengenden, L. G. Goldshtein and F. F. Sviridenko. *Soviet Journal of Atomic Energy,* v. 3, 1957, p. 1193-1197. (Translation by Consultants Bureau, Inc.)

Rate of scrap melting in experimental melts in 130 and 350-ton openhearth furnaces determined from the diminution in specific activity of metal samples containing Co^{60}. (D2d, D11q, 1-59; ST)

434-D. (French.) **Chronicle of Steelmaking. Competitive Position of the Martin Furnace.** G. Grenier. *Ecole des Mines et de la Metallurgie,* no. 3516, May 1958, p. 296-297.

(To be continued.)
(D2, A4, W18r; ST)

435-D.* (German.) **Plant Experiments on the Smelting of African Conakry Ore.** Wilhelm Wolf, Wilhelm vor dem Esche, Helmut Wysocki and Otto Steinbauer. *Stahl und Eisen,* v. 78, July 24, 1958, p. 1020-1027.

Experiments on fabrication of basic bessemer pig from a metallic burden with 30% Conakry ore, and on the fabrication of low-phosphorus iron from 100% Conakry ore, in a furnace of 800 tons daily output. The economy of the ore would increase if the metals and minerals present in the resulting slags were utilized. (To be continued.)
(D1a; CI-a)

436-D.* (German.) **Experiences in the Production and Processing of Small Sections Manufactured in the Continuous Casting Process.** Franz Leitner and Franz Schmidt. *Stahl und Eisen,* v. 78, July 24, 1958, p. 1028-1032.

Steels suggested are toolsteel with up to 0.9% C, low-alloyed Mn-Si, Cr-Mn and Cr-Mo steels. Best results were obtained when the time involved for the semi-liquid portion, from the mold to complete crystallization, was as short as possible. Initial pouring temperature and continuous casting speeds recommended. (D9q; AY, TS)

437-D.* (Russian.) **Smelting of Low-Manganese and Low-Phosphorus Iron.** B. N. Zherebin, V. P. Dembovetskii and V. M. Minkin. *Stal',* v. 18, July 1958, p. 578-585.

Elimination of Mn additions from blast furnace burden with consequent sharp reduction of Mn and P content in iron had no detrimental effect on quality. On the contrary, it substantially raised metallurgical value of iron for the openhearth and improved blast furnace performance characteristics. Manganese content was reduced from 1.78 to 0.54% and phosphorus from 0.26 to 0.15%; blast furnace productivity was increased by 5.4% while reducing coke consumption by 5.6%. 4 ref. (D1a; Fe, *Mn*)

438-D.* (Russian.) **Study of Continuous Casting of Steel With Models.** K. I. Afanas'eva and G. P. Ivantsov. *Stal',* v. 18, July 1958, p. 599-604.

By use of model method it was possible to define more accurately the hydrodynamic regularities of the metal flow in a cast billet and to develop methods for improving dimensions and shapes of casting devices. 5 ref. (D9q, 17-56; ST)

439-D.* (Russian.) **Properties of Oxygen Blown Steel Produced in Converters.** P. Ya. Ryzhkov, A. A. Mitrofanov and N. I. Beda. *Stal',* v. 18, July 1958, p. 643-647.

Mechanical properties of rimming or killed oxygen blown steel are practically the same as those produced in openhearth furnace. The gas content and the macro and microstructures are nearly equivalent. Testing of converter and openhearth steel samples at various temperatures and after aging shows that their ductility is nearly the same.
(D3f, Q-general; ST)

440-D. Operation of Blast Furnaces at High Top Pressure. I. A. Kuz'min. *Metallurg,* no. 7, July 1957, p. 3-5. (Henry Brutcher, Altadena, Calif., Translation no. 4243.)

Previously abstracted from original. See item 11-D, 1958.
(D1h; Fe)

441-D. Study of Blast Furnace Process by Isotope Methods. I. P. Bardin, P. L. Gruzin and S. V. Zemskii. *Doklady Akademii Nauk SSSR,* v. 114, no. 6. 1957, p. 1220-1223. (Henry Brutcher, Altadena, Calif., Translation no. 4305.)

Principles of the currently used isotope methods and their advantages. Results obtained at four blast-furnace plants (different furnace sizes) on movement of stock and wear of furnace refractories.
(D1, 1-59; Fe)

442-D. Production of Chromium-Nickel Steel With Use of Pelletized Nickelous Oxide. I. P. Zabaluev. *Stal',* v. 17, no. 10, 1957, p. 899-901. (Henry Brutcher, Altadena, Calif., Translation no. 4271.)

Previously abstracted from original. See item 96-D, 1958.
(D-general, 6-67, 18-67, 1-52; ST)

E Foundry

661-E.* Application of Sodium Silicates for Bonding Sands. F. W. Nield and David Epstein. *Castings,* v. 4, May 1958, p. 5-24.

Relationship between compression strength of sand bonded with sodium silicate cured with CO_2 or uncured and the grade of sodium silicate, concentration of sodium silicate, time of CO_2 gassing and temperature to which specimen is subjected. Conclusions concerning nature of bond. Relation between drying and compression strength and bench life of sodium silicate sand mixes. 4 ref. (E18n)

662-E.* (French.) **Zones of Influence of Risers. Possible Feed Distances and Effects. Pt. 1.** Richard Namur. *Fonderie Belge,* v. 28, June 1958, p. 191-193.

Mathematical study of solidification, contraction and compensation for contraction; general equations for zones of influence of risers; calculation of duration of freezing at a given point. (To be continued.)
(E22q)

663-E.* (French.) **Zones of Influence of Risers. Possible Feed Distances and Effects. Pt. 2.** Richard Namur. *Fonderie Belge,* v. 28, July 1958, p. 209-219.

Applications of formulas presented in Pt. 1 to risers for feeding a flat plate and a square bar. Influence of superheating of molten metal, size of risers, and use of chills on feed distances. Contraction, solidification and heat transfer. 5 ref.
(E22q, E22r, E25n, P11k, 4-53, 4-55)

664-E.* (Italian.) **Pointers on Light Alloy Casting Design.** G. Barchiesi. *Fonderia,* v. 7, June 1958, p. 241-248.

Metallurgical, mechanical and physical properties of light alloys. Solidification and use of chills; supply of metal to thick sections; shrinkage; castability of alloys; problems caused by inserts.
(E-general, E25, 17-51; Al, Mg, *Cu, Si, Zn*)

665-E.* (Italian.) **Testing of Oily Sand Binders.** Rinaldo Cannaneo. *Fonderia,* v. 7, June 1958, p. 249-255.

Definition, role, procedures for determination of saponification number, surface tension, acidity and water content. Preparation of reactives. (To be continued.) (E18n)

666-E.* (Italian.) **Epoxy Resins in the Construction of Patterns and Core Boxes.** *Fonderia,* v. 7, June 1958, p. 265-268.

Mechanical properties of a typical epoxy resin. Construction of patterns and core boxes by lamination with fiberglass or by casting; machining of cast patterns; simple method of repairing damaged surfaces. Cleaning of equipment used in handling resins; safety precautions to protect respiratory and skin areas. (E17, E18n, E21; NM-d30)

667-E.* (Japanese.) **Pulverizing of Silica Foundry Sands on Shock-Heating.** Umeji Harada and Keizo Nishiyama. *Japan Foundrymen's Society, Journal,* v. 30, June 1958, p. 456-467.

Four typical silica sands were analyzed. Pulverizing of each silica sand shock-heated to 1500° C. was related to grain size. Pulverizing is closely connected with the geological origin of each sand. On the whole, foundry silica sands on shock heating are more pulverized than new sands. Differences in pulverizing on shock-heating become smaller as the grain size diminishes. 12 ref.
(E18r)

668-E.* (Japanese.) **Relation Between Grain Size and Permeability in Molding Sand.** Jiro Kashima and Mototaka. *Japan Foundrymen's Society, Journal,* v. 30, June 1958, p. 468-471.

Permeability is determined by grain distribution, grain shape, the quality and quantity of the binder and the packing rate. Consequently, if the quality and quantity of binder and packing rate are kept constant, the relation between grain size and permeability may be determined in the form of an equation. (E18r)

669-E.* (Japanese.) **Properties of Shell Cores Made by the Blowing Process. Pt. 2. Moldability.** Kaoru Kato. *Japan Foundrymen's Society, Journal,* v. 30, June 1958, p. 472-478.

Shell test specimens were made by a core blower into several kinds of shape. With slender shell cores, resin-coated sand or resin-sand should be blown in the direction of core axes. An injection hole of smaller diameter seems to be beneficial. When the sand is blown in the direction perpendicular to the axis or the surface of the shell core, a specified suitable diameter of injection hole should be selected. (E19c)

670-E. Alloying and Heat Treating Ductile Cast Iron. Massachusetts Institute of Technology. (Watertown Arsenal.) *U. S. Office of Technical Services,* PB 131350, Aug. 1955, 95 p. $2.50.

Basic variables in risering and their effects on shrinkage. Proper control can reduce gross shrinkage to a level at which large sprues and flow-offs are sufficient to act as risers and feed the casting. Sponge-type shrinkage is caused by lack of adequate graphite precipatating. A carbon-silicon relationship was established to eliminate sponge shrinkage. How and where the principles of machinability apply to ductile cast iron; various conditions of cutting ductile iron matrices; and machining forces measured and analyzed; relationships of cutting fluids to machining forces and surface finish. (E22g, P10c, T2, G17k; CI-r)

671-E. Investigation of Nodular Cast Iron Manufactured in the Springfield Armory Casting Laboratory. O. Lubinkowski. Springfield Armory. *U. S. Office of Technical Services,* PB 131399, May 1957, 45 p. $1.25.

Good machinability and toughness of nodular cast iron, its excellent resistance to corrosion and high temperatures, led to successful effort to prepare thin-wall castings less than ½ in. thick. Magnesium-silicon alloy containing copper was used as the inoculant.
(E25; CI-r, *Mg, Si, C,* AD-p36)

672-E. Light Alloy Casting. *Design Engineering,* Aug. 1958, p. 33, 35-51.

Sand casting, permanent mold and die casting of Al, Mg and Mg-Zr alloys analyzed and rontrasted.
(E11, E12, E13; Al, Mg, *Zr*)

673-E. Steel Castings for Heavy Machines. *Foundry Trade Journal,* v. 105, July 3, 1958, p. 15-16. (From *Vestnik Mashinostroeniia,* Dec. 1957, p. 28-32.)

Recent developments in mechanized molding and casting in USSR.
(E19, 18-74; ST)

674-E. Chilled Iron Rolls. Production at Thomas Robinson & Son, Ltd. Trevor Kneale. *Iron and Steel,* v. 31, July 1958, p. 351-354.

(E22r, W23k; 5-66, CI)

675-E. Coreless, Hollow Die-Casting. *Metalworking Production,* v. 102, Aug. 1, 1958, p. 1345-1347.

New development in die-casting technique permits hollow casting without the use of cores. Wall thickness can be controlled, casting speed increased, metal saved and weight of product reduced.
(E13, 1-52)

676-E. (German.) **Testing Spherical Castings for Cavities.** Joseph Cz.kel. *Freiberger Forchungshefte,* v. B30-1, 1958, p. 209-226.

Influence of pouring time and casting temperature. 15 ref.
(E23, 2-61, 3-67; CI, 9-67)

677-E. (German.) **Manufacture and Properties of Resin Coated Sand.** G. Hevenesi and J. Szekeres. *Freiberger Forschungshefte,* v. B30-1, 1958, p. 227-238.

Procedures for preparation of shell-mold sand and testing with different resins and additions.
(E19c, E18n)

678-E. Use of Vacuum in Sand and Gravity-Die Casting to Minimize Waste. L. Pilz. *Giessereitechnik,* v. 2, no. 9, 1956, p. 202-206. (Henry Brutcher, Altadena, Calif., Translation no. 4297.

Application of vacuum to production of extremely light-section and dense castings of nonferrous metals. Portable vacuum installation.
(E11, E13, 1-73, 1-52)

679-E.* Cast Die Cavities. Pt. 2. Irwin Lubalin. *Precision Metal Molding,* v. 16, Aug. 1958, p. 30-31.

Shaw process cavities and cores which do not have substantial amounts of the cast skin removed by machining and polishing result in die life 50 to 60% superior to dies machined by conventional die sinking methods from wrought stock. Also better heat dispersion is found when an entire intricate cavity can be cast in one piece, not in a series of inserts. (E13, W19n)

680-E.* Design Castings for High Stress Uses. *Precision Metal Molding,* v. 16, Aug. 1958, p. 21-22.

High-strength Al casting alloy, tradenamed Tens-50, has superior tensile and yield strengths which permit many forgings to be replaced with castings. Additions of small amounts of Be and Na neutralize the embrittling action of both Fe and Si normally found in casting alloys and improve the fluidity of the melt so that sound, thin walls can be cast.
(E12, E25p; Al, *Be, Na,* 5-63)

681-E.* (German.) **Experiments on the Mechanical Qualities of 30-Mm. Diameter Gray-Iron Test Pieces Made With Permanent Molds.** Joseph Czikel and Josef Sturm. *Freiberger Forschungshefte,* no. B30-1, 1958, p. 7-45.

Permanent mold methods for obtaining machinable gray iron castings. Influence of cooling velocity on grain tensile strength and Brinell hardness is shown by means of test pieces cast with molds of different temperatures and wall thicknesses. Permanent mold castings have better mechanical properties than sand castings. 35 ref.
(E12, G17k, Q-general; CI, 5-63)

682-E.* (German.) **New Foundry Methods: CO_2 Molding, Necking Cores, Calcium Carbide Addition to the Cupola.** Gerd Scharf. *Freiberger Forschungshefte,* no. B30-1, 1958, p. 68-83.

Waterglass CO_2 technique; preparation of "necking cores" for facilitation of fettling. In the cold blast cupola furnace, an addition of 0.5 to 1.0% CaC_2 was found most efficient. (E10a, E18n, E21)

683-E.* (German.) **Studies on the Continuous Casting of Small Steel Parts in Shell Molds.** Hans Woykoss. *Freiberger Forschungshefte,* no. B30-1, 1958, p. 84-97.

Survey of parts for which the method is applicable. Suggestions for the manufacture of metal patterns. Casting in stack molds; vertical and horizontal casting. Manufacture of shell molds, sizes and arrangement of gates, feeders and risers. Machining allowances and shrinkage tolerances.
(E16c, 1-61; ST)

684-E.* (German.) **Induction Melting of Cast Iron and Its Significance for the East German Foundry Industries.** Gerhard Gertz. *Freiberger Forschungshefte,* no. B30-1, 1958, p. 98-109.

From the viewpoint of East German industry neither the hot blast furnace making high investment necessary nor the cold blast furnace requiring first-class coke have been economically satisfactory. Any country that is forced to import quality coal can use an electric furnace more economically. The most suitable induction furnaces are of a frequency from 2000 to 500 Hz (for charges of about 10 tons). An induction furnace gives cast iron of greater strength. 12 ref.
(E10r, W18a; CI)

685-E.* (German.) **Thermal Reclamation of Used Sands.** Joseph Czikel and Klaus Quappe. *Freiberger Forschungshefte,* no. B30-1, 1958, p. 110-134.

Different reclamation processes (e.g., air flow, washing with water, and burning the organic components); experiments with the burning procedure. Organic bound sands are reclaimable provided the temperatures are high enough and the quantity of oxygen is sufficient. 10 ref. (E18s, 2-61)

686-E.* (German.) **Automotive Parts of Nodular Cast Iron Made in the Cold Blast Cupola Furnace and Treated With Liquid Magnesium.** Walter Feicke and Karl Lange. *Freiberger Forschungshefte,* no. B30-1, 1958, p. 181-208.

These parts can compete with those made of malleable cast iron due to their steel-like physical properties and require even less wall thickness. In the Mg treatment a vessel with molten Mg is put on the surface of the molten iron. When the Mg ignites, the vessel is lowered to the pan bottom. Procedure for large and for small quantities. 5 ref. (E25q; CI-r, *Mg*)

687-E.* (German.) **Mass Production of Large Diesel Engine Crankcases of Light Metal.** Martin Solti. *Freiberger Forschungshefte,* no. B30-1, 1958, p. 239-261.

Old processes; new procedures carried on with new equipment. Details of molding, coremaking, design of pouring basins, runners, gates, skimmer gates and air drains. Melting and casting processes; cleaning and heat treatment of the cast crankcase. 4 ref. (E11, W11j; Al)

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

688-E.* (German.) **Methods for Increasing the Accuracy of Castings.** Fritz Naumann. *Freiberger Forschungshefte,* no. B30-1, 1958, p. 262-286.

Procedures with sand molds and with permanent molds and dies for the production of parts that require a minimum of machining, or no machining at all. Precision patterns, shell molds, a new kind of pattern. Practical examples.
(E-general, 17-54)

689-E. Investment Casting of Nonferrous Metals. E. Weisner. *Foundry Trade Journal,* v. 105, Aug. 7, 1958, p. 163-166.

(E15; EG-a38)

690-E. Alumina Coated Silica-Sand Molds for Heavy Sectioned Steel Castings. Béla Körös. *Kohaszati Lapok-Ontöde,* v. 91, Apr. 1958, p. 95-97.

(E19, E18p; ST)

691-E. (Hungarian.) **Producing Colloidal Graphite. Its Use in the Foundry.** Gyorgy Pavai. *Kohaszati Lapok-Ontöde,* v. 91, Apr. 1958, p. 85-90.

Results in coating molds for aluminum, iron, bronze and copper castings.
(E19; Cu, Cu-s, Fe, NM-k36)

692-E. Formation of Blowholes in Surface of Castings of Magnesium-Treated Cast Iron. A. D. Ushakov. *Liteinoe Proizvodstvo,* Mar. 1957, p. 19-20. (Henry Brutcher, Altadena, Calif., Translation no. 4291.)

Previously abstracted from original. See item 257-E, 1957.
(E25s; CI, *Mg,* AD-p, 9-68)

693-E. (Russian.) **Application of Malleable Cast Iron for Agricultural Machinery.** M. M. Turbovskii. *Liteinoe Proizvodstvo,* June 1958, p. 2-4.

Melting iron in cupola furnace with oxygen blast in forehearth, sharply reduces cost of metal as compared to use of Duplex process. 9 ref. (E10a, T3, 17-57; CI-s)

694-E. (Russian.) **Mold Pressing Under High Pressure.** I. R. Dudnik. *Liteinoe Proizvodstvo,* June 1958, p. 4-9.

Molding in earthen forms under high pressure results in products of high precision and clean surfaces. Fully mechanized molding assembly. (E19)

695-E. (Russian.) **Mechanization of Assembly, Filling and Knocking Out of Shell Molds.** A. M. Neimark. *Liteinoe Proizvodstvo,* June 1958, p. 9-11.

(E16c; W19g)

696-E. (Russian.) **Formation of Spheroidal Graphite and Progress in Nodular Iron Technology.** B. S. Mil'man. *Liteinoe Proizvodstvo,* June 1958, p. 11-17.

Method developed for producing spheroidal graphite by use of inert gas in liquid iron of low sulphur content. White iron with high Mg content was used. 22 ref.
(E25q; CI-r, *Mg,* EG-m)

697-E. (Russian.) **Control of Gas Saturation in Casting Copper Alloys.** A. M. Kartseva and T. A. Vikhoreva. *Zavodskaya Laboratoriya,* v. 24, Apr. 1958, p. 410-413.

Method is based on determination of pressure at moment of separation of first bubble of dissolved gases from melt.
(E25s; X12n, Cu-b)

698-E. (Swedish.) **Oxygen in Cast Iron.** Gustav Ostberg. *Gjuteriet,* v. 48, June-July 1958, p. 97-104.

Quantity of oxygen that can be found dissolved in cast iron calculated for the system FeO-C-Si. Results of oxygen determinations in malleable iron; different methods for sampling and analysis.
(E25s, S11r; CI, *O*)

699-E.* **The Controlled-Slag Hot-Blast Cupola.** D. Fleming. *British Foundryman,* v. 51, June 1958, p. 291-302.

Recuperative system for blast heating. Early results and problems, particularly those relating to necessity for controlling high melting temperature in fully cooled slag-line cupolas. Importance of air velocity at tuyeres. Evolution of conical shell design; theoretical explanation of behavior encountered with fully cooled melting zones; size limitations on furnace. Relationships between slag basicity, Si content and metal temperatures; control of carbon pick-up and sulphur removal; heat balance of plant; continuous operation. 18 ref.
(E10a, W18d, 17-51; CI-n)

700-E.* **A Simple Guide to the Use of Exothermic Feeding Compounds in the Foundry.** G. N. Cherry. *British Foundryman,* v. 51, June 1958, p. 303-307.

Correct use and advantages of exothermic feeders. Relationship between shape and dimensions of riser and casting defects.
(E22q, E22s; 5-60, 9-67, 9-68)

701-E. (Russian.) **Nitrogen in Cast Iron.** L. I. Levi. *Liteinoe Proizvodstvo,* no. 6, 1955, p. 22-25.

Treatment of molten cast iron with nitrogenous compounds (ammonia, cyanamides, ferrocyanamides) which dissociate and release chemically active atomic nitrogen, strengthening the iron. With increased nitrogen content, ferrite disappears, pearlite is stabilized and condensed and graphitic inclusions are disintegrated and dissipated. Greatest increase in strength is observed in common gray iron.
(E25q; CI, *N*)

702-E. An Introduction to Patternmaking in Plastics. H. G. C. King. *British Foundryman,* v. 51, June 1958, p. 282-290.

Use of epoxy resins for foundry patterns in British railways shop. Methods and equipment, production of master pattern and molds, small solid patterns and large laminated patterns. (E17; NM-d30)

703-E. Refractories in the Foundry. J. H. Cannon and A. L. Bradley. *Refractories Journal,* v. 34, July 1958, p. 309-317.

Refractory failure caused by physical erosion, chemical composition and slag attack, characteristics of Al and MgO, brick, monolithic linings. 8 ref.
(E-general; RM-h)

704-E. (German.) **Centrifugal or Die Casting?** *Giesserei Praxis,* v. 14, July 25, 1958, p. 281-282.

Centrifugal casting assures improved mechanical and structural properties. Horizontal and vertical casting at 10 to 3,000 rpm. Influence of case and cross section on quality. (E14, E13)

705-E.* **Surface Sinking Defects in Light Sectioned Grey Iron Castings.** A. G. Fuller and I. C. H. Hughes. *Castings,* v. 4, June 1958, p. 33-48.

Some factors in reducing incidence of sinking defects are: eutectic composition, high manganese, low sulphur content, no inoculation, high melting temperature, low melting rate, or holding, pouring temperature of 1280° C., proper gating ratio, limiting amount of flow into molds, rapid filling, uniformity of pattern manufacture, use of rigid molds, casting with bosses uppermost. Factors minimizing one defect may increase incidence of another so changes in foundry practice should be controlled. 9 ref.
(E11; CI, 9-71)

706-E. Influence of the Vacuum and Temperature of Superheating on the Structure of Pig-Iron. I. E. Brainin and S. I. Shapovalov. *Physics of Metals and Metallography,* v. 4, no. 1, 1957, p. 91-98. (Translation by Pergamon Institute.)

Previously abstracted from original. See item 558-E, 1957.
(E25q, E10, 1-73; CI)

707-E. Magnesium Treatment of Low-Sulphur Basic-Cupola Iron. G. I. Kletskin. *Liteinoe Proizvodstvo,* v. 9, no. 9, 1957, p. 21-26. (Henry Brutcher, Altadena, Calif., Translation no. 4303.)

Previously abstracted from original. See item 98-E, 1958.
(E10a; CI-a, Mg, AD-a)

708-E. (German.) **Patternmaking.** Heinz Lucas. *Giessereitechnik,* v. 4, June 1958 p. 128-132.

Co-ordination of pattern design and patternmaking with other foundry activities. (E17)

709-E. (German.) **Nonferrous Cast Metal—a Versatile Material.** Gunther Andexer. *Industrie Anzeiger,* v. 80, May 2, 1958, p. 521-523.

The basic metals are: Cu, Zn, Al, Mg. Properties of different alloys and the most adequate casting process. Economic considerations.
(E-general; EG-a38)

710-E. (Book.) **Foundry Manual (Navships 250-0334).** John Varga, Jr., and N. H. Keyser. 291 p. 1958. Battelle Memorial Institute, 505 King Ave., Columbus 1, Ohio. $3. (Available from U. S. Government Printing Office, Washington 25, D. C.)

(E-general)

F Primary Mechanical Working

259-F.* (French.) **Investigation of the Forging of Alloy T-C$_3$Fe.** A. Saulnier and R. Develay. *Revue de Metallurgie,* v. 55, May 1958, p. 433-441.

The mechanical properties of forged products in T-C$_3$Fe (titanium with 2.7% Cr and 1.3% Fe) determined as a function of the temperature at the start of the first hot working, reduction of thickness during the hot working, and method of taking the specimens. Structures were observed with optical and electron microscopes. A clear difference in properties is established according to whether the forging temperature is within the $\alpha + \beta$ field (below 800° C.) or in the β field (above 800° C.).
(F22, Q-general; Ti, *Cr, Fe*)

260-F.* (French.) **Investigation of the Forging of Alloy T-A$_6$V.** R. Syre and A. Saulnier. *Revue de Metallurgie,* v. 55, May 1958, p. 442-447.

To achieve tensile strength of at

least 92 kg. per sq.mm. in forged products in the titanium alloy T-A₆V (6% Al, 4% V) with elongations of at least 10%, it is necessary to transform the lamellar cast structure into an equiaxed structure. With forging beginning at 950° C. this cannot be achieved unless reductions of thickness of 80% are applied during final working. Reduction can be lowered to 50% either by decreasing the temperature at which forging is begun to 900° C. or by using a swaging pass before the final hot working.
(F22; Ti, *Al, V*)

261-F. Metal Forming for the Missile Age. Alexander Zeitlin. *Astronautics,* v. 3, Aug. 1958, p. 22-24.

New developments, such as 50,000-ton forging presses, explosive forming and cavity forming.
(F22, G-general)

262-F. Hot Forging With R. F. Induction Heating. *Brown Boveri Review,* v. 45, July 1958, p. 174-178.

Advantages of radio-frequency heating. (F21b, F22, W20L, 1-69)

263-F. Bar and Tube Straightening Machines. E. L. Tinley. *Iron and Steel,* v. 31, July 1958, p. 373-374.

(F29r, 1-52; 4-55, 4-60)

264-F. Lower Costs With No-Draft Forgings. Homer Harvey. *Materials In Design Engineering,* v. 48, Aug. 1958, p. 94-95.

(F22, Al-b, 4-51, 17-51)

265-F. (German.) **Calculation of Power Requirement in Upsetting and Drop Forging.** H. Mäkelt. *Werkstatt und Betrieb,* v. 91, June 1958, p. 337-341.

Calculating power requirement by means of six-part computation table. Deformation during upsetting; degree of deformation in hot forming.
(F22j, F22n)

266-F. Relationships in the Drawing of Metal Wire in Presence of Lubricants. S. Ya. Veiler and V. I. Likhtman. *Doklady Akademmii Nauk, SSSR,* v. 114, no. 6, 1957, p. 1224-1227. (Henry Brutcher. Altadena, Calif., Translation no. 4293.)

Elimination of concept of coefficient of friction from equations for calculating the forces required for a given type of deformation in the working of metals by pressure. Quantitative evaluation of effect of various lubricants in the working of metals by pressure, specifically the drawing of metal wire.
(F28; NM-h)

267-F.* (German.) **Cold Rolling of Steel of High Carbon Content With Sorbitic and Pearlitic Structure.** Wilfried Roth, Hermann Lassek and Fritz Fischer. *Stahl und Eisen,* v. 78, July 10, 1958, p. 948-955.

Cold rolling of high-carbon steels, without intermittent annealing, revealed the superior malleability and tensile strength of sorbitic over pearlitic structure. No significant difference could be detected in tempering quality between cold rolled and soft rolled steels. Heat treating tests on Grade C 115 W 2 steel for mechanical and structural behavior indicated that deformed structure of cold rolled strip could be transformed into granular cementite at low temperatures and in a short time. Sorbitic steels offer a substantial cost reduction potential over pearliitic steels and may lead to refinements in strip mill processes. 14 ref. (F23, 1-67, Q-general, 2-60, 2-64, 2-71; ST, 4-53)

268-F.* (German.) **Effect of Different Working Conditions of a Three-Stand Cold Rolling Tandem Mill Train on Mechanical Properties of Steel Strip.** Jacques Gerhard Brockhaus, Fritz Fischer, Harald Graetz and Klaus Ohlwein. *Stahl und Eisen,* v. 78, July 10, 1958, p. 955-960.

Cold rolling of low-carbon strip steel, 0.98 × 1.50-mm., reduced 70 to 60% by a 178-mm. three-stand tandem mill train, reveals that total tandem mill capacity increases when reduction is greater at second and third mill stands. Tensile strength improves with highest reduction at third stand. Influence of rolling on proof stress, tensile strength and hardness can be remedied by annealing and rerolling. Greater rolling capacity and tensile strength result when blasting is used for descaling instead of pickling. Rerolling eliminates effect of different descaling methods on mechanical properties. Tallow emulsion is easier to apply than wax emulsion but impairs rolling capacity, rolling strength and tensile strength of strip steel. 4 ref. (F23, W23f, Q-general, 2-64; CN, 4-53)

269-F.* (German.) **Experiments on the Application of the Upsetting Process With Cone-Faced Pressure Dies in the Hot Upsetting of Metals.** Gerhard Gartner. *Freiberger Forschungshefte,* no. B27, 1958, p. 28-51.

The right inclination of the cone faces is essential for preserving the cylindric mantle surface of the test piece, due to the friction caused by the cone angle. In the hot upsetting process good results could be obtained only when temperature loss over the heat conducting pressure dies can be avoided. The experiments were preformed with pure Al, duralumin and electrolytic Cu. 11 ref. (F22j, 1-66; Al, Cu-a)

270-F.* (German.) **A New Theory of Rolling.** Alexander Geleji. *Freiberger Forschungshefte,* no. B27, 1958, p. 52-83.

A study on the different forces present when a material passes through the gap between rolls. Some older theories do not include all forces involved. Mathematical formula for resistance against deformation at any point showing the interplay of stresses during the rolling process, spread and forward slip. 19 ref. (F23; 10-51)

271-F.* (German.) **The Neutral Point Angle and the Forward Slip in a Rolling Process With Spread.** Zygmunt Wusatowski and Zbigniew Szalajda. *Freiberger Forschungshefte,* no. B27, 1958, p. 84-110.

Mathematical studies show that the forward slip grows with increased rolling pressure and decreased upsetting effect, while it is reduced by an increased temperature. With an unchanged upsetting effect, the forward slip decreases in the same porportion as the spread increases. The proportion neutral-point-angle/contact-angle decreases with an increasing spread and, as a rule, with an increased temperature. 9 ref. (F23)

272-F. How to Get More for Your Forging Dollar. *Iron Age,* v. 182, Aug. 21, 1958, p. 89-104.

Guide to purchase and most effective use of carbon and low-alloy steel forgings.
(F22, A4s; CN-b, AY-b, 4-51, 17-57)

273-F. Cold Rollability of Transformer Steels Containing More Than 3.3% Si. Franz Lihl and Paul Zemsch. *Archiv für das Eisenhüttenwesen,* v. 26, 1955, p. 599-602. (Iron and Steel Institute Translation no. 987.)

Previously abstracted from original. See item 261-F, 1955.
(F23, Q23q; AY, SGA-n, *Si*)

274-F. (German.) **A Special Slide Rule for Ekelund's Formulas.** Stanislaw Koncewicz. *Freiberger Forschungshefte,* v. B27, 1958, p. 111-127.

Rolling forces. 4 ref. (F23)

275-F. (German.) **Factor of Mean Elongation With Profiled Roll Passes.** Kazimierz Rytel. *Freiberger Forschungshefte,* v. B27, 1958, p. 128-140

(F23)

276-F.* (Hungarian.) **Theories of Tube Reduction.** Nandor Torma. *Kohaszati Lapok,* v. 91, Apr. 1958, p. 191-195.

Rolling procedure in which the external diameter of the tube gradually decreases. There is no forming tool in the tube, consequently thickness of wall may form freely. Investigations were performed with two power-driven tube reducing roll systems, one for the small tubes, the other for larger sizes. Reduced wall thickness can be accurately calculated from rolling speed. 7 ref. (F26s)

277-F. The Calculation of Drawing Force and Die Pressure in Wire-Drawing. P. W. Whitton. *Wire Industry,* v. 25, Aug. 1958, p. 735-738.

Various wire drawing theories examined in light of new knowledge of the values for the coefficient of friction between the drawn wire and the die. (F28, Q9p)

278-F. (Russian.) **Monograph for Determination of Radius of Deformation in Cold Rolling of Strip and Sheet.** D. Ya. Gurevich. *Stal',* v. 18, July 1958, p. 635-638.

(F23, Q23q; ST, 4-53)

279-F.* (Russian.) **Automatic Control of Shearing of Rolled Stock.** V. L. Epshtein. *Stal',* v. 18, July 1958, p. 622-628.

Investigation of rolling process in a 630/450-mm. rolling mill makes it possible to develop a schedule and block-diagram of a digital computer for automatic control of shearing according to theoretical weight of rolled stock.
(F29q, X14k, 1-52; ST)

280-F. Where Faster Heating Saves. C. A. McFadden. *Steel,* v. 143, Sept. 1, 1958, p. 68, 70, 72, 73.

(F21b, J-general; ST, 17-53)

281-F. Gear Forging Advances. *Steel,* v. 143, Sept. 8, 1958, p. 100-101.

(F22, T7a)

G Secondary Mechanical Working

Forming and Machining

451-G.* **Explosive Metallurgy.** H. P. Tardif and W. H. Erickson. *Canadian Mining & Metallurgical Bulletin,* v. 51, June 1958, p. 352-359.

Practical applications of explosives to metallic or mechanical systems: explosive rivets and bolts; cartridge-powered tools; shaped charges; engraving of metal plates; explosive testing of steels; explosive forming

of metals. Metals react differently under impulsive loading. Mechanical and structural changes include fracture and flow-pattern changes, little distortion of metal except for area of impact. Changes in microstructure have been observed, but little work has been done as yet to explain changes.
(G23, Q6)

452-G.* Beryllium Machining Characteristics. Donald R. Walker. *Mechanical Engineering,* v. 80, Aug. 1958, p. 57-62.

Surface damage, chip formation, cutting temperature, tool life, rake angle and their effects. (G17; Be)

453-G. Automatic Grinding With Coated Abrasives Finds Widespread Use for Roughing, Finishing and Polishing. J. Karl McLaughlin. *Machinery,* v. 64, Aug. 1958, p. 122-136.

(G18, L10b, W25c; NM-j)

454-G. Developments in Precision Boring. C. L. David. *Machinery (London),* v. 93, July 30, 1958, p. 243-250.

Clamping techniques, effect of cutting forces, carbide tools and boring bars, tool adjustment, multispindle machining, automatic loading devices and methods of automatic control. (G17d)

455-G. Improved Methods for Deep Drawing. *Metal Progress,* v. 74, Aug. 1958, p. 84-86.

Equal ductility in both directions —longitudinal and across rolling direction—is desirable for deep and difficult stampings. Steel and aluminum sheet, as well as new metals such as beryllium and zirconium, may be improved in this manner by the same techniques as control the direction of crystallization of iron-silicon transformer sheet.
(G4b, Q23q)

456-G. Hobbing After Hardening Avoids Distortion. M. E. Samuelson. *Metalworking Production,* June 13, 1958, p. 1033-1035.

Process results in reduction of errors in lead, profile and runout, with better finish, and less grinding required. (G17b)

457-G. Let's Look at Honing, Your Latest Maintenance Tool. Steve Elonka. *Power,* Aug. 1957, p. 118-119.

Typical applications. (G19n)

458-G. Forming Molybdenum Tubing: Grain Size Is Key. *Steel,* v. 143, Aug. 11, 1958, p. 82-83.

Arc-cast Mo can be formed by cold extrusion. Grain refining is a key step. Good properties result but material loss is high. (G5; Mo, 4-60)

459-G. Machining Speeds Tripled of Tough Missile Metals in Cutting Tool Tests. H. F. Wallen. *Western Metalworking,* v. 16, June 1958, p. 72-73.

Tests show higher speeds, throwaway carbide inserts and special grinding machines improve production. (G17, G18, T6n; SGA-j)

460-G. (French.) New Applications of Ultrasonic Machining. J. Welch. *Machine Moderne,* v. 52, June 1958, p. 9-12.

(G24c)

461-G. (Japanese.) **Behavior of Chip in Cutting Steel.** Keiji Okushima and Kiyoshi Minato. *Japan Society of Mechanical Engineers, Transactions,* v. 142, June 1958, p. 333-339.

9 ref. (G17; ST)

462-G. (Japanese.) **Grinding Fluids. Pt. 1.** Ryozo Furuichi and Yukio Tanaka. *Japan Society of Mechanical Engineers, Transactions,* v. 142, June 1958, p. 340-345.

Relationship between grinding ratio, tangential grinding force, wear of grinding wheel and dilution of grinding fluids. (G18)

463-G.* Property of Free Machining. Fundamental Considerations. K. G. Lewis. *Iron and Steel,* v. 31, Mar. 1958, p. 85-91.

Chip formation and the basic properties affecting machining performance. Free-machining additives; methods of addition of sulphur and lead to steel. Influence of cutting fluids on the machining of free-cutting materials; effect of graphite in cast iron and cold working of steel as free-machining aids. 61 ref.
(G17k; ST, CI, *S, Pb*)

464-G.* (English.) **Electric Spark Machining of Metals.** Jindrich Stanek *Czechoslovak Heavy Industry,* no. 5, 1958, p. 33-46.

General principles; characteristics of both "Sparcatron" and anode mechanical methods; relation of energy liberated by discharge, frequency of discharge, physical properties of electrode and workpiece and magnitude of gap to the rate of metal removal; properties of machine surface; tolerances; performance of Czechoslovak machines of both types. 5 ref. (G24a, 1-52)

465-G.* (Japanese.) **Study of High Speed Machining. Pt. 10. Machinability of Materials.** Hidehiko Takeyama and Eiji Usui. *Government Mechanical Laboratory, Journal,* v. 12, May 1958, p. 89-93.

Machining characteristic as defined by shear angle or chip thickness ratio can be analyzed only by tool-chip contact area. Aluminum, copper, brass, mild steel, alloy steel and Meehanite cast iron machined under definite conditions to investigate tool-chip contact area and chip formation. Results compared with shearing stress data. Verified that slope of shear test curve near the rupture point is closely related with tool-chip contact area or machinability. 4 ref.
(G17k; Al, Cu, Cu-n, AY-b, CI)

466-G. Apply Rolling Before Chromium Plating of Heavy Loaded Components. G. P. Kotlyarevskii. *Metallovedenie i Obrabotka Metallov,* July 1958, p. 52-53. (Henry Brutcher, Altadena, Calif., Translation no. 4286.)

Although electrolytic chromium plating increases wear resistance, it also tends to weaken resitsance to corrosion and fatigue. To overcome these harmful effects it is recommended that surfaces be rolled before plating.
(G23s, L17, Q9n, Q7; Cr, 8-68)

467-G. Flame Washing for the Foundry. *Foundry Trade Journal,* v. 105, Aug. 7, 1958, p. 177-178.

(G22, L10)

468-G. Choose the Right Contact Wheel for Better Belt Grinding. *Iron Age,* v. 182, July 3, 1958, p. 64-66.

(G18k, W25c)

469-G. A Practical Manual for Stamping Design. Pt. 2. Carter C. Higgins. *Machine Design,* Aug. 7, 1958, p. 111-117.

Design principles for flanged parts, tabs, reinforcing, deep drawing alteration of thickness.
(G3, 17-51)

470-G. Peenamatic Shot Peening Machine for Forming Integrally-Stiffened Wing Panels. *Machinery (London),* v. 93, Aug. 6, 1958, p. 311-312.

(G23n, 1-52, T24a)

471-G. Ultra-Precision Grinding of Small Cylindrical Parts. *Machinery (London),* v. 93, Aug. 6, 1958, p. 313-314.

(G18)

472-G.* (Italian.) **Study of Deformation of Material During Wiredrawing. Pt. 2.** Mario Lanfranco. *Ingegneria Meccanica,* v. 7, Mar. 1958, p. 7-15.

Types of friction and relative values of coefficient of friction; heating of wire and die during drawing; lubrication and wear; characteristics and behavior of mineral and organic lubricants. 17 ref.
(G28, Q9)

473-G. Natural Gas for Cheaper Cutting. William J. Semple. *American Machinist,* v. 102, Aug. 25, 1958, p. 69-71.

(G22g; RM-m35)

474-G. Machinability Testing. David N. Smith. *American Society of Tool Engineers, Research Report no. 8,* 1958, 4 p. $1.

Metal-cutting operation treated as "input-output" process, with input being controlled variables (machine, process, environment) and output being machine wear, chips, tool wear, and product characteristics.
(G17k, 1-54)

475-G. The Mechanism of Chip Formation. Donald Gideon, Ralph Simon and Horace Grover. *American Society of Tool Engineers, Research Report* no. 9, 1958, 8 p. $1.

(G17)

476-G. Some Thermal and Physical Aspects of Cutting. Ralph Simon, Donald Gideon and Horace Grover. *American Society of Tool Engineers, Research Report no. 10,* 1958, 7 p. $1.

(G17, 2-61)

477-G. Present Knowledge of Cutting Fluids. Stanley L. Cosgrove and Roy W. Greenlee. *American Society of Tool Engineers, Research Report no. 11,* 1958, 19 p. $1.

Role of cutting fluids; principles and experimental data on theory of cutting fluid action. (G17; NM-h)

478-G. Influence of Metallurgical Properties on Metal-Cutting Operations. Francis W. Boulger. *American Society of Tool Engineers, Research Report no. 12,* 1958, 19 p. $1.

(G17k)

479-G. What Is Known Today About Metal Cutting. Francis W. Boulger. *American Society of Tool Engineers, Research Report no. 14,* 1958, 9 p. $1.

Tool life, productivity, chip formation, cutting temperatures and fluids, surface finish, testing methods; influence of tool and cut geometry, cutting speed, microstructure. (G17, G25, 3-71; NM-h, 17-52)

480-G. Computer Control in Flame Profiling. *Canadian Metalworking,* v. 21, Aug. 1958, p. 28, 30, 32, 34, 36, 37.

Computer-controlled flame cutting unit leads to elimination of templet making and hand control in curve profiling.
(G22g; 18-67, 18-74)

481-G. Orthogonal Cutting of a Work-Hardening Material. D. G. Christopherson, P. L. B. Oxley and

W. B. Palmer. *Engineering,* v. 186, July 25, 1958, p. 113-115.

Development of approximate theory; mathematical analysis. Calculation of relationships between chip thickness and rake angle, other variables. (G17, 10-52)

482-G. Sub-Zero Quench Aids Aluminum Forming. R. T. Delaney. *Metalworking Production,* v. 102, Aug. 8, 1958, p. 1384-1385.

(G1, G17, 2-63; Al-b)

483-G. Finish-Machining Graphite Wheel Molds. Gilbert C. Close. *Modern Machine Shop,* v. 31, Sept. 1958, p. 136-138.

Tracer-controlled boring mill equipped with single-pass cutting tools is used to prepare and maintain graphite molds for railroad car wheels. (G19r, W19g, 1-59; NM-k36)

484-G. Cut Costs on Machining Die Castings. *Precision Metal Molding,* v. 16, Aug. 1958, p. 23-28.

Special machines and some of the standard components that can be used for tapping, drilling, surfacing a mounting face or milling contours that cannot be cast.
(G17; 5-61)

485-G. Explosives Form Space Age Shapes. *Steel,* v. 143, Aug. 25, 1958, p. 82-86.

(G-general; NM-k34)

486-G. (Italian.) **Metallurgy and Machinability of Steels.** Ferruccio Grandi and Athos Masi. *Ingegneria Meccanica,* v. 7, Jan. 1958, p. 7-15.

11 ref. (G17k; ST)

487-G. Stock Dies Cut Short Run Costs. *Metal Forming and Fabricating,* v. 20, Aug. 1958, p. 26-27.

(G3, W24n)

488-G. New Methods Meet the Challenge of Honeycombs. *Steel,* v. 143, Sept. 1, 1958, p. 60-61.

Machining and fabricating methods which maintain the close tolerances required in contoured panels from honeycomb.
(G-general, T24a; 7-59)

489-G. Impact Extrusion Takes on Hard Alloys. *Steel,* v. 143, Sept. 1, 1958, p. 64-65.

(G5; Al-b)

H Powder Metallurgy

119-H.* Powder Metallurgy of Uranium and Thorium. Alan Blainey. *Metal Progress,* v. 74, Aug. 1958, p. 79-84.

Powders derived from alternative production methods vary greatly in size and shape, thus affecting "compactibility" either hot or cold. Surface oxide or compounds may prevent atomic diffusion across particle boundaries during sintering and result in weak or brittle parts. Cermets made from oxide or carbide particles have been used extensively in test reactors and components.
(H-general, T11, 17-57; U, Th)

120-H.* Getting More From Metal Powders. *Metal Progress,* v. 74, July 1958, p. 101-104.

Powder metallurgy holders for carbide tools look promising; metal powders solve barrel finishing problems; slip casting expands potential for large, complicated parts from powders. These were among the new developments reported at the annual meeting of the Metal Powder Association. (H-general)

121-H. (Russian.) **Method for Determination of the Dimensions of Particles of Aluminum Powder.** I. N. Varlamova and B. P. Golubev. *Zavodskaya Laboratoriya,* no. 1, 1956, p. 80-82.

Rapid determination using a single 0.1-g. sample of the powder, by measuring average thickness of particles on the basis of the surface area occupied by the sample when it is distributed in a continuous single layer on water, and average transverse dimension of the particles under the microscope.
(H11j; Al)

122-H.* (French.) **Powder Metallurgy. General Development and Future Possibilities in the Field of Refractory Machine Parts and Cermets.** R. Kieffer and R. Meyer. *Chimie et Industrie,* v. 79, May 1958, p. 589-599.

Properties and uses of cermets composed of oxides and metals, carbides and metals, borides and metals, nitrides and metals, sulphides and cermets with intermetallic phase. Techniques employed in manufacture of cermets; some metallurgical considerations. 123 ref. (Conclusion.) (H-general, 6-70)

123-H.* (French.) **Influence of Double Compaction on the Kinetics of Sintering of Agglomerates of Carbonyl Iron.** Georges Cizeron. *Comptes Rendus,* v. 246, May 28, 1958, p. 3060-3063.

Role of grain boundaries in elimination of pores from a sinter is illustrated by technique of double compaction and double sintering. Fragmentation of a structure which has undergone grain growth by annealing in the gamma phase causes elimination of pores and re-acceleration of speed of densification when material is resintered in alpha phase. (H15; Fe)

124-H. Furnace Sintering of Metals and Ceramics. Pt. 1. R. L. Harper. *Industrial Heating,* v. 25, Aug. 1958, p. 1530-1532, 1534, 1536, 1538.

Types of furnaces used and processes involved in making parts by sintering compacted powders of metals and ceramics (individually or combined), and metallizing of certain ceramic parts.
(H15, W26e; 6-68, NM-f)

125-H.* A Preliminary Study of the Production and Properties of Beryllium Sheet. N. A. Hill. *United Kingdom Atomic Energy Authority, AERE M/M 193,* 1958, 15 p.

Room-temperature tensile tests on beryllium sheet rolled from hot extruded, hot forged and cold compacted electrolytic powder show that maximum elongation in the plane of the sheet was obtained from cross-rolled hot forged powder. Cold bend tests were able to distinguish between unidirectionally rolled and cross-rolled sheet. 10 ref. (H14, Q5; Be, 4-53)

126-H. Fundamentals of Sintering. Pt. 2. A. L. Pranatis, L. S. Castelman and L. Seigle. *U. S. Atomic Energy Commission SEP-247,* 1958, 32 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Rates of spheroidization and densification of Au and Ni wire compacts were measured as a function of time, temperature and wire size. The necks joining the sintered particles were found to grow proportionally to the one-fifth root of time. The value of the coefficient of self-diffusion calculated from the sintering rate is of the same order of magnitude as that obtained by ordinary tracer techniques but with a somewhat higher activation energy. (H15)

127-H.* (Russian.) **Efficient Method for Production of Hard Alloy Drawing Blocks for Tubemaking.** G. S. Maksimovich. *Stal',* v. 18, July 1958, p. 629-633.

Production of heavy-duty drawing blocks by means of hot pressing a compact into a steel race followed by mechanized grinding and finishing has considerably increased speed of tube drawing and resulted in great savings in drawing tools, as result of greater durability of drawing blocks. 4 ref.
(H14h, F26r, 1-52)

128-H.* (Book.) **Tooling for Metal Powder Parts.** George H. De Groat. 242 p. 1958. McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 36, N. Y. $7.50.

Advantages and economics in comparison to other production processes. Considerations of size, geometry, density requirements, required physical properties and surface finish in the design of structural metal powder parts; production properties and utilization of metal powders; powder preparation and conditioning. Comparison of briquetting pressed types, compacting practice. Data on relation of density to briquetting pressure, depth of fill, particle size and properties. Calculations involved in determining materials and design of punches, core pins, rods and dies. Die designs for specific parts; sintering methods, sintering atmosphere, furnace types. Sintering times and temperatures for various powders. Relation of sintering temperature and time to mechanical properties, density, shrinkage and swelling. Coining, sizing, machining, cleaning, tumbling, impregnating, infiltrating, electroplating, resintering and heat treating operations. 115 ref. (H-general, W26)

J Heat Treatment

276-J.* Stress Relieving of Stainless Steels and the Associated Metallurgy. R. A. Huseby. *Welding Journal,* v. 37, July 1958, p. 304s-315s.

Mechanical properties of the austenitic Cr-Ni stainless steels appear to be only mildly affected by fabricating operations; stress relieving usually is employed only for conditions where severe stress corrosion may be encountered, or for a high degree of dimensional stability. Thermal stress relieving of the ferritic Cr stainless steels after fabrication is necessary to obtain the desired mechanical properties and corrosion resistance. Martensitic stainless steels require preheating and high interpass temperatures during welding and immediate post-

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

heating after welding to avoid cracking. 19 ref.
(J1a, K-general; SS)

277-J.* (Italian.) **Carbonitriding Process.** G. Limentani. *Metallurgia Italiana,* v. 50, May 1958, p. 191-195.

Process and properties imparted to steel and alloy steel parts; residual austenite and methods of reducing same to minimum; tempering characteristics of carbonitrided steels as compared with those of casehardened steels. Description of carbonitriding furnace.
(J28m, W27n; ST)

278-J.* **Getting the Most From a Drying System.** James E. Greever. *Metal Progress,* v. 74, July 1958, p. 83-85.

Very low dew points (−95° F.) are required for the manufacture of transistor metals, annealing stainless, and sintering many powder compacts. Even a well-designed drying system will fail to produce such gas unless the purging gas used while regenerating the activated alumina silica gel is equally dry. (J2k, W28q)

279-J.* **Heat Treating Affects Aluminum Extrusions.** J. K. McLaughlin. *Metal Progress,* v. 74, July 1958, p. 105-107.

Aluminum extruders like to "homogenize" 6063 Al billets before extruding (this raises the strength of the product). Treatment discussed, along with the quantitative effects of several variables.
(J21; F24; Al-b)

280-J.* (German.) **Nitriding Titanium Steels.** L. Gillemot and M. Tomory. *Periodica Polytechnica,* v. 2, no. 1, 1958, p. 1-17.

Titanium steels require less nitriding time and the Ti:C ratio determines the resulting surface hardness. On steels with Ti:C $<$ 4 the nitriding produces a comparatively soft layer with gradual transition to the core; in steels with Ti:C $>$ 4, it produces a harder layer. The hardness increases with increasing Ti:C ratio. Test nitrided bars with sharp notches show approximately 50% greater fatigue limit than annealed unalloyed steel. 19 ref.
(J28k; AY, *Ti*)

281-J.* (German.) **Effect of Annealing on the Precipitation of Aluminum Nitride and on the Mechanical Properties of Plain Carbon Steels.** Paul Werthebach and Hubert Hoff. *Stahl und Eisen,* v. 78, May 29, 1958, p. 736-743.

Influence of temperature used in rolling and heat treating on the amount of nitrogen combined with Al in blown steels and openhearth steels containing 0.06 to 0.42% C, 0.04 to 0.17% Si, 0.4 to 0.32% Mn, 0.04 to 0.20% Al and 0.003 to 0.011% N. Rate of dissolution of aluminum nitride during heating and rate of precipitation in cooling at various temperature ranges. Relates the fixation of nitrogen to Al in deep drawing steels to the elongation in the yield point range and the formation of stretcher lines. Relation between the susceptibility to aging and the difference in the tensile strength at 20 and 200° C. Effect of the normalizing treatment of steels containing Al on the notch toughness and grain size.
(J23, J24, Q-general; CN, *Al, N*)

282-J. **Surface Hardening of Titanium in Fused Borax.** A. N. Minkevich and Yu. N. Shul'ga. *Metal Industry,* v. 93, July 25, 1958, p. 67-69. (From Metallovedenie i Obrabotka Metallov, Dec. 1957, p. 56-61.)

Previously abstracted from original. See item 122-J, 1958.
(J28; Ti, NM-a33)

283-J. **Heat Treatment of MST 6Al-4V Titanium Alloy.** S. R. Seagle, G. W. Bauer and D. Evers. *Metal Treating,* v. 9, July-Aug. 1958, p. 4, 6-7.

(J-general, Q-general; Ti-b)

284-J. **High Temperature Carburizing Is Practical.** *Steel,* v. 143, Aug. 4, 1958, p. 98-100.

Tests on AISI 1117 carbon steel, 4615 Ni-Mo steel and Ni-Cr-Mo steels 8620, 9315. (J28g, 1-66; CN, AY)

285-J.* (German.) **Effect of Working Conditions on Mechanical Properties When Patenting Rope Wires After Electric Resistance Heating.** Werner Lueg and Karl Schemmer. *Stahl und Eisen,* v. 78, July 10, 1958, p. 960-965.

Process of patenting 0.4, 0.6 and 0.8% carbon steel wires, prepatented, rolled and drawn into 3-mm. rope wires after direct resistance heating at 20 to 50 m. per min. and temperatures from 20° C. over Ac_3 to 1000° C., and indirect resistance heating in gas oven at 10 m. per min. and 880° C. Wires, drawn 12 times and reduced by 93% to 0.75 mm., were examined after each pull to detect influence of patenting process on mechanical properties. Patenting preceded by resistance heating generally improves the wire and diminishes dispersion as long as operating conditions permit an almost complete austenitization and extensive isothermal conversion when passing through quenching bath.
(J25, Q-general, 3-68; ST, 4-61)

286-J.* (Russian.) **Speeding the Aging Process of Aluminum-Magnesium Alloys by Small Admixtures of Silver and Zinc.** V. I. Arkharov, I. P. Berenova and L. M. Magat. *Fizika Metallov i Metallovedenie,* v. 5, no. 5, 1957, p. 516-526.

By measuring the lattice parameters of hard alloys during aging it was established that admixtures of 0.2-1.0% Zn and Ag speed the aging process of Al-Mg alloys. Study of ternary system Al-Mg-Zn shows that major factor in speeding aging is the internal adsorption of Zn into periphery of crystals of decomposing hard alloy. 13 ref.
(J27d, M24c, 2-60; Al, Mg, *Ag, Zn*)

287-J. **Accelerated Aging of Heat Resistant Nickel Alloys Under Effect of Ultrasonics.** V. S. Ermakov and E. A. Al'ftan. *Metallovdenie i Obrabotka Metallov,* July 1958, p. 22-27. (Henry Brutcher, Altadena, Calif., Translation no. 4278.)

Ultrasonic waves of 20-26 kgts. frequency accelerate the aging process of alloys. Doubling the ultrasonic energy makes possible shortening of aging period by 40 to 50 times. Application of ultrasonics during aging at 800° makes it possible to eliminate effect of coagulation and hardening of alloy is 15 to 20 times faster than under usual procedure. 6 ref.
(J27d, 1-74; Ni-b)

288-J. **Nitriding of High-Strength Magnesium Cast Iron.** Yu. M. Lakhtin and D. S. Pinchuk. *Metallovedenie i Obrabotka Metallov,* July 1958, p. 39-42. (Henry Brutcher, Altadena, Calif., Translation no. 4282.)

The nitrided surface of Mg-Fe has great hardness and corrosion risistance in water. Nitriding of nodular iron requires much less time than steel or usual irons; nitriding at 650° to obtain surface depth of 0.16 mm. requires only 1 hr. and for depth of 0.35 mm., 3 hr. For best nitriding results it is recommended that Mg-Fe with a ferrite pearlite base be used at a diffusion temperature of 720-740°. 5 ref.
(J28k, Q29n; CI-r, *Mg*)

289-J. **Improved Processing of Cold Rolling Roll Banks of 9XF Steel.** I. E. Brainin, A. I. Kondrashov and V. A. Kharchenko. *Metallovedenie i Obrabotka Metallov,* July 1958, p. 43-46. (Henry Brutcher, Altadena, Calif., Translation no. 4283.)

Use of 9XF steel made in basic openhearth has replaced eutectoid steels for roll banks because of its greater resistance to crack formation and flocculation. Rapid grain growth takes place at 950° when the secondary carbides dissolve in the austenite. Raising the austenizing temperature from 830 to 960° increases the stability of cooled austenite. The suggested two-stage isothermal treatment eliminates need for normalizing in order to destroy flocculation in carbide lattice.
(J22, W23k; ST-e)

290-J. **Effect of Heat Treatment on Wear Resistance of Steel in Soil Mass.** N. M. Serpik and M. M. Kantor. *Metallovedenie i Obrabotka Metallov,* July 1958, p. 46-50. (Henry Brutcher, Altadena, Calif., Translation no. 4284.)

Isothermal treatment of steels used in road building machinery produces greater wear resistance than usual hardening methods followed by tempering. Tests show that isothermally treated steel has 1.5 greater wear resistance than Lemesh (plowshare) steels.
(J26p, Q9n; ST)

291-J. **Effect of Barium Acetate on Activity of Hard Carburizers.** L. K. Luksha. *Metallovedenie i Obrabotka Metallov,* July 1958, p. 50-52. (Henry Brutcher, Altadena, Calif., Translation no. 4285.)

The high activity of carburizers (10-15% charcoal, 80% semi-coke from coal, barium acetate varying from 5-15%) as compared to carbonates is to be explained by the presence of acetone in the cementite formed during the decomposition of acetates. Presence of acetone in cementite permits elimination of charcoal and its replacement with material of high thermal conductivity. (J28g; ST)

292-J.* (Russian.) **Carbide Separation on Tempering of Alloy Steel.** A. V. Stepanov. *Metallovedenie i Obrabotka Metallov,* July 1958, p. 59-61.

Carbide separation takes place in final stage of tempering. The transformation of the cementite in the carbide alloy and the formation of carbide crystals requires a minimum temperature of 500°. Hardness begins to develop in high-alloy steel following 1 hr. exposure to constant temperature of 500°. It reaches maximum hardness at 550-600°, but rapidly declines after 625°. 4 ref.
(J29, N8a; AY)

293-J.* (French.) **Cold Working of Aluminum Alloys Facilitated by Solu-**

(*) **Articles Available Through Photocopy Service; See Coupon, p. 75.**

tion Heat Treatment. Blaise Cliche. *Ingenieur,* v. 44, Summer 1958, p. 40-42.

Solution heat treatment for 0.040-in. thick sheet of aged 24S-T3 Alclad, consists of 10-sec. immersion in solution of potassium nitrate and sodium nitrate heated to 280° C. and quench in cold water or air. Permits cold working during first 5 hr. after treatment. Rapid cooling affords greater ductility. Speed of cooling governs speed of reversion to mechanical characteristics of previous aged condition. (J27a; Al-b)

294-J.* (French.) **Carburizing. Measurement of the Depth of Carburized Layers.** Gerard de Smet. *Pratique des Industries Mecaniques,* v. 44, Mar. 1958, p. 64-68.

Structural changes in carburized steel; surface and homogeneous carburizing. Destructive and nondestructive methods of determining depth and hardness of carburized zones, including 30-sec. method employing new device called "Testorgraf" developed in Germany. (J28g, 1-54; ST)

295-J.* (French.) **Five Years' Observation of the "Sulfinuz" Process.** Y. de Villemeur. *Revue de Mecanique,* v. 4, Jan-Mar. 1958, p. 16-22.

Description of process; micrographic study of surface hardened steel specimens. Anti-seizure properties and conformability of Sulfinuzed machine parts as shown by laboratory tests and on basis of actual working conditions. (J4c, Q9; ST)

296-J. Automatic Controls Guarantee Top-Quality Carburizing. P. M. Unterweiser. *Iron Age,* v. 182, July 3, 1958, p. 61-63.

Large continuous carburizing furnaces featuring accurate control of dew point, maintained case depth and carbon content to close tolerances for alloy steel railroad bearings. (J28g, W27n, X7g; AY)

297-J. (Hungarian.) **Effect of Titanium on the Surface Properties of Case-Hardened Steels.** Janos Prohaszka. *Kohaszati Lapok,* v. 91, Apr. 1958, p. 180-186.

9 ref. (J28; ST, *Ti*)

298-J.* (German.) **Effect of Gas Nitriding and Salt Bath Nitriding on Properties of Structural Steels. Pt. 3.** H. Wiegand and M. Koch. *Metalloberflache,* v. 12, Aug. 1958, p. 225-230.

Bend tests indicate that strength increases rapidly during the first salt bath process but soon reaches a limit. In the gas process there is a slower increase, but strength increases (beyond the salt bath limit) by continuing the process over a longer period. With alloy steels in salt bath, it is advisable to keep temperature near lower limit for increased endurance strength. (J28k; ST)

299-J.* (German.) **Intergranular Oxidation of Cr-Ni-W Steels.** P. Csokan. *Metalloberflache,* v. 12, Aug. 1958, p. 230-232.

Fatigue caused by decarburization investigated. The uniform tempered sorbite showed a surface zone characterized by a bright network of decarburized material, probably along the primary grain boundaries. Only the hardening process seemed to affect this structure. Experiments with Cu electroplating to exclude oxygen gave good results. (J4a, Q7; AY)

300-J.* (German.) **Bright Annealing With Controlled Atmospheres.** O. Meyer-Witting. *Metallwaren-Industrie und Galvanotechnik,* v. 49, May 1958, p. 195-201.

Removal of vapors resulting from rolling and drawing lubricants from the heating chamber is necessary. Besides protection against oxygen, reducing, recarburizing and nitriding, effects are available by adjusting composition of the gas. Use of hydrogen and of mixtures of N, H, CO and CO_2 prepared by incomplete combustion of fuel gases. Steam content more harmful with higher annealing temperatures, and causes more oxidation with long than with short cooling periods. (J23a, J2k)

301-J. How to Harden Steel Rolls. C. J. McCormick. *Iron Age,* v. 182, Aug. 28, 1958, p. 60-62. (J22, J26p, W23k; ST)

302-J.* (German.) **Heat Treating With Medium Frequency.** H. Krake, W. Seifert and J. Mainka. *Fertigungstechnik,* v. 8, July 1958, p. 319-323.

Experiments with rough-turned gear blanks of heat treatable steel C 45, performed in a medium-frequency induction with 125-kw. generator. Correct hardening temperature was 850-870° C. For a tensile strength of 75-85 kg. per sq. mm. the tempering range was 670-680° C. Water was used as a quenchant. Prerequisites for good results: equal heat distribution to all points; thermostatic control of temperature; sufficient supply of water to insure fast and thorough quenching; use of normalized (in this case at 900° C.) material. (J2g, T7a; ST)

303-J. (Russian.) **Effect of Holding Time During Tempering on the Mechanical Properties of Various Steels.** V. N. Semirog-Orlik. *Trudy Instituta Stroitel'nykh Mekhanizatsiya Akademii Nauk, Ukraniskii SSR,* no. 22, 1956, p. 70-80.

Effect of prolonging (up to 240 min.) the tempering of steels U7A, U10, U12A and SHKH15 at 200° C. on the magnitude of the stresses set up under conditions of all-round irregular stressed state with various related strains. Test pieces were pressed in pairs from steel 20 which was subjected to compression. Strength of U7A steel decreases smoothly with an increase in holding time to 180 min. while being annealed at 200° C. In steels U10 and U12 there was a large drop in strength for the first 20 min., and in steel SHKH15 for the first 60 min. After holding for over 180 min. the strength of all steels remains stable or increases. (J29, Q27a; ST)

304-J. (Russian.) **Dispersion Hardening of Magnetically Soft Iron.** N. F. Vyaznikov. *Trudy Leningradskogo Politekhnicheskogo Instituta,* no. 180, 1955, p. 68-73.

Effects of annealing temperature, time of soaking and cooling conditions on the value of magnetizing force and of the permeability of commercially pure iron. Magnetic properties of annealed iron are affected principally by residual stresses. Study of mechanical properties as functions of the cooling conditions during annealing. (J23, P16, Q-general; Fe, SGA-n)

K Assembling and Joining

491-K. Report on Adhesive Bonding of Titanium. H. E. Pattee, G. E. Faulkner and P. J. Rieppel. *Battelle Memorial Institute, TML Report no. 104,* 1958, 28 p.

Considers metal-to-metal adhesive bonding and its applications. Adhesives, surface treatments, production consideration and evaluation of bonded structures. 85 ref. (K12)

492-K.* High Quality Fusion Welding of Aluminum. T. B. Correy. *Light Metal Age,* v. 16, June 1958, p. 8-12.

Methods for arc welding Al. A thin section of annealed 1100 alloy (2-S), Alcoa A-13 alloy braze, and a thick section of annealed 1100 alloy were fusion welded by a capacitor balanced inert-gas shielded, tungsten electrode, alternating current arc process. Result was a weld of laboratory quality with smooth, shiny surface, devoid of porosities, pipes and inclusions, highly corrosion resistant and water-tight, with uniform cross section and penetration. (K1; W29d; Al)

493-K.* The Meaning of Weldability. T. B. Jefferson. *Welding Engineer,* v. 43, Mid-June, 1958, p. 5-20.

Weldability and data on chemical composition, mechanical properties, physical properties of low, medium and high-carbon steels, low-alloy high-sulphur steels, low-alloy Mn steels, low-alloy Ni steels, low-alloy Ni-Cr steels, low-alloy Mo steels, low-alloy Cr steel, low-alloy high-tensile steel, austenitic stainless steels, martensitic stainless steels, ferritic stainless steel, austenitic Mn steel. Al, Al alloys, Mg, Mg alloys, Cu, brasses, bronze, Cu-Si, Cu-Ni, aluminum bronze, B-Cu, phosphorus bronze, Ni and Ni alloys. (K9s; CN-g, CNr, AY, b, SS, Al, Mg, Cu, Ni)

494-K.* Welding Titanium. Karl Bungardt and Klaus Rudinger. *Metal Progress,* v. 74 July 1958, p. 184-185. Digest of "A Contribution to the Problem of Welding Titanium Alloys". ("Zeitschrift für Metallkunde", v. 47, Aug. 1956, p. 585-593.)

A post weld anneal is recommended for all alloys (1 hr. at 1290° F.) to reduce residual stresses and improve notch toughness. Section thickness of the weldment affects the length of time required at the temperature. Weldments made up of both alpha and alpha + beta Ti alloys exhibit superior properties. (K-general, J1a; Ti-b)

495-K.* Cyclic Strength Tests on Solders. Influence of Cerium. *Tin and Its Uses,* no. 42, Spring 1958, p. 14-16.

Cyclic loading at 250° F. of joints soldered with 70Sn-30Pb and 30Sn-70Pb solders containing up to 0.50% cerium demonstrated marked superiority of the high tin solder and further improvement of performance of the high tin solder with addition of cerium. (K7; Sn, Pb, Ce)

496-K.* Inert-Gas Tungsten-Arc Welding of Titanium for Nuclear and Chemical Industries. G. M. Adamson and W. J. Leonard. *Welding Journal,* v. 37, July 1958, p. 673-682.

Process by which unalloyed Ti may be field welded using only con-

 (*)**Articles Available Through Photocopy Service; See Coupon, p. 75.**

ventional inert-gas tungsten-arc equipment. The process is applicable to the high-quality individual welds required in field welding for the chemical industry rather than to high-speed repetitive production welds. (K1d, T29; Ti)

497-K.* Fundamentals of Brazing for Elevated-Temperature Service. M. D. Bellware. *Welding Journal,* v. 37, July 1958, p. 683-691.

Classifications of the brazing alloys considered are silver-base, copper-base, manganese, gold and palladium-base and nickel-base. For service temperatures above about 1000° F., Ni-base brazing alloys have produced the best results. When brazing alloys in the form of fine powder are used, they are often mixed with a suitable vehicle such as acrylic-resin or methyl-cellulose. These binders leave practically no residue after brazing. 9 ref.
(K8, 2-62; Ag, Cu, Mn, Au, Pd, Ni)

498-K.* Prediction of Weld Heat-Affected Zone Microstructures From Continuous - Cooling Transformation Data. E. F. Nippes and E. C. Nelson. *Welding Journal,* v. 37, July 1958, p. 289s-294s.

A system of predicting the microstructures of the heat affected zones of welds from continuous cooling transformation data and weld thermal cycles. Microstructures of experimental welds are compared with the predicted microstructures, and the system of calculations and its experimental foundations are analyzed to explain the differences between theory and actual welds. 6 ref. (K9, M27)

499-K* Welding Metallurgy of Cr-Mo-V Steels for High-Temperature Steam-Turbine Components. R. J. Christoffel, R. M. Curran, F. H. Domina and C. H. Soldan. *Welding Journal,* v. 37, July 1958, p. 295s-303s.

Summary of preheat and post-weld heat treatments developed for welding Cr-Mo-V base metal with a ½% Cr-1% Mo electrode using both the manual metal-arc and submerged-arc processes. Rupture strength of the ½% Cr-1% Mo weld metal was evaluated and found to be less than that of the base metal. The effect of composition and heat treatment on the rupture strength of low-alloy steel weld metals was evaluated. 7 ref. (K1, W11k, J1a; ST, Cr, Mo, V)

500-K.* Fabrication and Service Factors Involved in Failure of Welded Steam Receivers. A. J. Babecki and P. P. Puzak. *Welding Journal,* v. 37, July 1958, p. 320s-325s.

Base-metal cracking in the vicinity of the nozzle and manhole reinforcement pads was discovered in 65-in. diameter catapult steam receivers aboard naval aircraft carriers after 1 to 1½ yrs. of service. Fabrication defects in the form of porosity, undercutting and poor fit-up were found in all three receiver sections. Typical fatigue-type markings of crack propagation were found on the crack surfaces emenating from weld-metal porosity.
(K9, 9-68, 9-72)

501-K.* Low Crack Sensitivity of Steel Joint Welded by CO_2-O_2 Arc Welding. H. Sekiguchi and I. Masumoto. *Welding Journal,* v. 37, July 1958, p. 326s-336s.

A mixed gas of carbon dioxide and oxygen is supplied around the arc and molten pool and a bare steel wire containing suitable quantities of deoxidizers is used as a metal electrode. Results of measurements on hydrogen contents and crack sensitivities of steel joints are given. Hydrogen content of the weld is very low in comparison with those by other processes. 10 ref.
(K1d; ST)

502-K.* Joining Problems Aired. J. L. McCloud. *Metal Progress,* v. 74, July 1958, p. 93-96.

Serviced requirements for metal assemblies used in jet and rocket engines and in atomic applications are becoming more stringent. This has focused attention on improved methods for brazing and welding metals for high-temperature service.
(K-general)

503-K.* Role of Phosphorus in Austenitic Manganese Weld Metal. W. T. Delong, W. L. Lutes and H. F. Reid. *Welding Journal,* v. 37, July 1958, p. 316s-319s.

Nickel-manganese weld metals with reduced phosphorus contents in the range 0.01 to 0.02% had outstanding tensile strength, ductility and crack resistance. Phosphorus contents of about 0.035% appeared the maximum that could be tolerated without impairment of the properties of the weld deposit. General response of Mo-Mn weld metals to reduction of phosphorus content paralleled those observed in Ni-Mn weld metals. 7 ref. (K9, 2-60; SS, *P, Ni, Mn*)

504-K. Development of Oxidation and Liquid Sodium Resistant Brazing Alloys. D. A. Canonico and H. Schwartzbart. Armour Research Foundation. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131745, Mar. 1958, 44 p. $1.25.

Development of filler metals for brazing Type 310 stainless steel to Inconel, resistant to oxidation and attack by molten sodium at 1650° F.
(K8; SGA-f, Fe-b, Cr-b, Ni-b, SS)

505-K. The Production Man's Guide to Adhesive Bonding Methods. John P. Wright. *Metalworking Production,* v. 102, Aug. 1, 1958, p. 1352-1358.
(K12, K11)

506-K. Arc Versus Gas Welding on Gray Cast Iron—Which Should It Be? Jose Carlos Pellegrino. *Welding Engineer,* v. 42, July 1958, p. 48.
(K1a, K2g; CI-n)

507-K. Selection, Welding of CrMo Alloy Steel Pipe. Jay Bland. *Welding Engineer,* v. 43, July 1958, p. 34-36.
(K1, 4-60; AY, *Cr, Mo*)

508-K. Welding and Stainless Maintain Water Turbines. Lloyd McWilliams. *Welding Engineer,* v. 43, July 1958, p. 38-40.
(K1, T7h; SS)

509-K. Improving the Fatigue Life of Spot Welds. *Welding Journal,* v. 37, July 1958, p. 315s-336s.

Increase of fatigue life through stress distribution in hydrodynamically compressed spot welds.
(K3n, Q7)

510-K. How Good Is Your Welder Power Supply? A. C. Johnson and F. E. Donathan. *Welding Journal,* v. 37, July 1958, p. 692-699.

Simple electronic counter developed to indicate the frequency with which excessive voltage drops occur. (K-general, W29a)

511-K. Design Tips for Dry Hydrogen Brazed Parts. H. Lewis. *Western Metalworking,* v. 16, June 1958, p. 23-26.
(K8, K6q, SGA-f, 17-51)

512-K. (German.) **Wiping Solder in Manufacture of Motor Car Bodies and in Cable Joining.** H. Johnen. *Schweissen und Schneiden,* v. 10, July 1958, p. 281-283.

Wiping operation; determination of wiping temperature and properties; suitable solders.
(K7a, T21a, T1b; SGA-f)

513-K. Improvement of Quality of Weld Metal. A. A. Alov and V. S. Vinogradov. *Svarochnoe Proizvodstvo,* July 1957, p. 9-10. (Henry Brutcher, Altadena, Calif., Translation no 4116.)

Effect of transverse electrode vibration during welding (submerged arc) on the impact strength of the weld metal. (K1e, K9r)

514-K.* Helpful Hints for Successful Brazing. Orland Jack. *Carbide Engineering,* Aug. 1958, p. 9-12.

Brazing techniques for carbide tool tips; cleanliness, care, accuracy essential for successful joints.
(K8, T6n; 6-69)

515-K.* Industrial Applications of Magnetic-Flux Gas-Shielded Arc Welding. R. T. Telford and F. T. Stanchus. *Welding Journal,* v. 37, Aug. 1958, p. 771-778.

Process has several advantages compared to covered-electrode welding: up to an 80% reduction in costs; up to a 400% increase in welding speeds; excellent weld quality, mechanical properties, appearance and lack of undercutting. Use of magnetic-flux welding for root and backing passes as preparation for submerged-arc welding improves weld quality and cuts costs.
(K1d, K1e)

516-K.* Inert - Gas - Shielded Arc Welding of Silicon and Aluminum Bronze. Paul L. Hemmes. *Welding Journal,* v. 37, Aug. 1958, p. 779-788.

Joint design, welding procedures, shielding gas, operational techniques and mechanical strength of welded joints. In most applications the inert-gas-shielded arc-welding processes are most efficient for welding both silicon and aluminum bronze.
(K1d; Cu-n, *Si, Al*)

517-K.* Casting Weldments in a Petroleum Refinery. J. Bland, C. B. Parrish and R. C. Wheeler. *Welding Journal,* v. 37, Aug. 1958, p. 789-798.

Weldability characteristics of low and intermediate Cr-Mo alloy steels. Castings which meet specification requirements for chemistry and tensile properties, in addition to being virtually free from casting defects, are satisfactory components of petroleum refining equipment and process lines. Typical examples of repair and maintenance.
(K9s, T29n, 17-57; AY, 5-60)

518-K.* Diffusion Bonding Below 1000° F. J. T. Niemann, R. P. Sopher and P. J. Rieppel. *Welding Journal,* v. 37, Aug. 1958, p. 337s-342s.

Diffusion-bonding techniques for joining Be-Cu and Monel. Good joints were obtained with Au-Cu, Au-Ag, Au-Pb and Au-Al combinations. From the standpoint of strength, Au-Cu and Au-Ag were comparable (13,000 psi. shear) and superior to the Au-Pb and Au-Al combinations which were found to be quite brittle. 5 ref.
(K5k; Cu-b, Ni-b, SGA-f)

519-K.* Control of Melting Rate and Metal Transfer in Gas-Shielded Metal-Arc Welding. Pt. 1. Control

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

of Electrode Melting Rate. A. Lesnewich. *Welding Journal,* v. 37, Aug. 1958, p. 343s-353s.

Melting rates of electrodes having a fixed composition using the gas-shielded metal arc with reverse-polarity direct current are dependent only upon the welding current, electrode extension and electrode diameter. Heat for electrode melting is developed by anode or cathode reactions and electrical-resistance heating. Very little, if any, heat is due to radiation from the weld pool or the arc stream. 9 ref. (K1d, K9n)

520-K.* The Control of Porosity in High-Nickel Alloy Welds. G. R. Pease, R. E. Brien and P. E. Legrand. *Welding Journal,* v. 37, Aug. 1958, p. 354s-360s.

Tests were conducted to establish what gases will cause porosity and in what amounts they are damaging. Nitrogen was found to be extremely damaging to the weld soundness of Cr-free alloys; oxygen, carbon monoxide and carbon dioxide were less so and hydrogen was relatively innocuous. Cr-containing alloys were more resistant to damaging effects by all the gases. The addition of Ti and other gas-fixing elements to the weld deposit increases the breadth of the welding conditions under which porosity-free welds can be prepared. 17 ref. (K9r, 9-68; Ni-b)

521-K.* The Effect of Welding Speed on Strength of 6061-T4 Aluminum Joints. William L. Burch. *Welding Journal,* v. 37, Aug. 1958, p. 361s-367s.

6061-T4 aluminum joints could be welded by the inert-gas-shielded tungsten arc process, which upon aging had nearly the strength of 6061-T6. Welding speed was the most important of the many factors affecting response to aging. Slow speeds caused high heat input, practically annealing the base metal. With increasing speeds the joint strength increased rapidly up to a speed of 15 in. per min. above which the tensile strength was uniformly high at 90-95% of T-6 strength. 5 ref. (K1d, Q27d; Al-b)

522-K.* (French.) **Use of Gas for Brazing.** *Pratique des Industries Mecaniques,* v. 41, Apr. 1958, p. 92-95.

Gas brazing techniques and equipment. (K8g, 1-52)

523-K.* (Russian.) **Electrode Wires for Welding in Carbon Dioxide Gas.** N. M. Novozhilov and A. M. Sokolova. *Svarochnoe Proizvodstvo,* July 1958, p. 10-14.

For welding low-carbon steels in CO_2 gas it is recommended that electrode wires contain Si and Mn as deoxidizers. For welding of rimming and killed low-carbon steels at 500 amp. the electrode wires should contain 0.05-0.12% C, 0.6-1.0% Si and 1.4-2.4% Mn. This composition can also be used for other low-carbon steels. Addition of Cr, Ni, Mo and Cu will produce welds of many different properties. 13 ref. (K1, W29h; CN, ST-c, ST-d)

524-K.* (Russian.) **Strength of Various Types of Titanium Welds.** F. E. Tret'yakov and G. E. Kainova. *Svarochnoe Proizvodstvo,* July 1958, p. 19-23.

The wear resistance of spot and roll welds subjected to high-frequency stress is very low. The strength of spot and roll welds subjected to cyclical stress at a raised temperature declines more slowly than that of the base metal. The strength of two-layer spot welds is much greater than that of single layer welds under static stress and low-frequency cyclical stress. (K9r, Q9n, Q27a; Ti-b, 7-51)

525-K.* (Russian.) **Fuzing of Brass on Steel Products by Gas Flame.** I. A. Nenaezdnikov. *Svarochnoe Proizvodstvo,* July 1958, p. 35-38.

Causes of crack formation when fuzing brass on carbon steel as well as on Ni-Cr-Mo steels of 22-24-mm. thickness used in shipbuilding. Heating of complex shapes to 900-950° before fuzing results in largest number of cracks. More cracks form on alloy than on carbon steel. Absence of cracks in fuzed brass layers is to be explained by its high plastic qualities in the process of crystallization. Varying temperature with different shapes and sizes will minimize cracks. (K2h, 9-72; Cu-n, CN, SS)

526-K.* (French.) **Arc Welding.** Victor Caron. *Ingenieur,* v. 44, Summer 1958, p. 9-11.

Thermal and metallurgical principles and phenomena. (K1)

527-K. (English.) **Some New Resistance Welding Machines of Czechoslovak Manufacture.** Mario Benes. *Czechoslovak Heavy Industry,* no. 5, 1958, p. 2-8.

(K3, 1-52)

528-K. (English.) **Several Interesting Examples of Resistance Welding Applications Used in the Czechoslovak Industry.** Ladislav Pliva. *Czechoslovak Heavy Industry,* no. 5, 1958, p. 9-15.

Application of spot, seam or flash welding in joining low-carbon steel for concrete reinforcement; welding sheet steel for automobile body component, joining thin steel wire, welding Cu to Al and producing motorcycle rims. (K3; ST, Al, Cu)

529-K. (English.) **Czechoslovak Automatic and Semi-Automatic Submerged Arc Welders.** Miloslav Pavlasek and Miroslav Duben. *Czechoslovak Heavy Industry,* no. 5, 1958, p. 17-27.

(K1e, 1-52)

530-K. (English.) **Automatic Welding of Boiler Stays Under Flux.** Adolf Turek and J. Lukasek. *Czechoslovak Heavy Industry,* no. 5, 1958, p. 28-31.

Joining steel stays to boiler wall by means of automatic submerged arc welding. (K1e, T26q)

531-K. Silver Brazing Gives High-Strength Joints. *Metalworking,* v. 14, July 1958, p. 10-11.

(K8j; Ag)

532-K. How to Calculate Stresses in Adhesive Joints. H. A. Perry. *Product Engineering,* v. 29, July 7, 1958, p. 64-67.

(K12, Q25k)

533-K. (Russian.) **Weldability of Ferrite-Austenitic Steels.** I. A. Zaks. *Svarochnoe Proizvodstvo,* July 1958, p. 5-10.

Experiments with welding of high-strength corrosion resistant steels with minimum yield point of 40 kg. per sq. mm. Exposure for 2-3 hr. at 650-850° greatly increases corrosion resistance. 7 ref. (K9s, R-general; SS)

534-K. (Russian.) **Welding of Turbine Martensite Steel.** G. A. Nikolaev and A. V. Mordvintseva. *Svarochnoe Proizvodstvo,* July 1958, p. 1-5.

Experiments show possibilities of welding turbine sections of high-alloy martensitic steel in protective medium. 4 ref. (K1d, W11m; SS-c)

535-K.* Shrink-Fitting by Stress Relief. A. Peiter. *Engineers' Digest,* v. 19, July 1958, p. 305-307.

Relief of internal stresses in a quenched steel ring causes it to contract. This principle used to obtain shrink-fitting of rings on shafts. 4 ref. (K13r)

536-K.* (German.) **Adhesive Bonding of Metals, a New Joining Method.** H. Rebeski. *Werkstattstechnik und Maschinenbau,* v. 48, June 1958, p. 302-306.

The bonding of thin sheet metal in the outer skin of an airplane wing. The joints are riveted after bonding, then the skin is tightened around the wing with the help of a special fixture giving the upper wing an initial stress to prevent folds. Since the adhesive should not harden during these operations, a thermosetting cement is used and hardened afterward by heat. Other required properties of the adhesive are resistance to peeling, weathering and changes in temperature. (K12, T24a; NM-d30)

537-K. Soldering of Uranium. G. S. Hanks, D. T. Doll, J. M. Taub and E. L. Brundige. *U. S. Atomic Energy Commission TID-8018,* 1958, 15 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

Joining of uranium to uranium using a number of commerical soft solders and fusible alloys. Ultrasonic soldering iron has proved the best method for joining U to itself and to other metals, such as stainless steel. The soldering characteristics of U may best be compared to those of Al. (K7; U)

538-K. Welding Thin-Walled Uranium Cylinders. E. L. Brundige, J. M. Taub, G. S. Hanks and D. T. Doll. *U. S. Atomic Energy Commission TID-8019,* 1958, 11 p. (Available from U. S. Office of Technical Services, Washington 25, D.C.) $.50.

Inert-gas shielded-arc method without filler metal gave uranium welds free from porosity, cracks and oxide inclusions. Tensile strength and yield strength exceeded the strength of cast metal. Surface condition and purity of the inert-gas used affected weld soundness. Straight polarity direct current was used to achieve maximum penetration and to provide arc stability. (K1d; U)

539-K. LC Welding—It's Really Cool. *Canadian Metalworking,* v. 21, Aug. 1958, p. 24-26.

"LC" arc welding system deposits conventional flux-covered electrodes, and while so doing, drains resistance heat out of the electrodes as they are being consumed by the arc and converted into weld metal. (K1a)

540-K. Evaluation of Spot Welds Made Through Primers and Sealers. B. A. Schevo. *Welding Journal,* v. 37, Aug. 1958, p. 799-802.

Primers and sealers were found to have no detrimental effect on the weld strength when welding was performed in accordance with proper procedure. (K3n, K9r)

541-K. Current Welding Research Problems. *Welding Journal,* v. 37, Aug. 1958, p. 379s-384s.

List was made to inform Welding Research Council project committees and university research workers of some of the more important pro-

(*)**Articles Available Through Photocopy Service; See Coupon, p. 75.**

blems facing industry. Suggestions come largely from engineers, scientists and executives of American industry and government agencies. (K-general, A9)

542-K. (Italian.) **Submerged Arc Welding Machines. Pt. 1.** Oscar Grossi. *Ingegneria Meccanica,* v. 7, Jan. 1958, p. 61-66; Feb. 1958, p. 7-15.

(K1e, 1-52)

543-K. (Italian.) **Unionarc Welding Process.** Oscar Grossi. *Ingegneria Meccanica,* v. 7, Apr. 1958, p. 21-24.

(K1d)

544-K. (Book.) **Handbook of Fastening and Joining of Metal Parts.** Vallory H. Laughner and Augustus D. Hargan. 622 p. 1958. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. $15.

Screw and pipe threads; screws, bolts and nuts; locking nuts, washers and retaining rings; riveting, setting and staking; gas, arc and thermit welding; brazing and soldering; adhesives and adhesive-bonded joints. (K-general)

545-K. (Book.) **Elevated Temperature Properties of Weld-Deposits and Weldments.** 228 p. 1958. American Society for Testing Materials, STP 226. Special Technical Publication, 1916 Race St., Philadelphia 3, Pa. $5.50.

Elevated temperature data on steels and similar alloys as presented by current good welding practice.
(K1, Q-general, 2-62; SS, ST, 7-51)

L Cleaning Coating and Finishing

659-L.* A Survey of the Factors Controlling Metallic Diffusion From the Gas Phase. R. L. Samuel. *Murex Limited Review,* v. 1, no. 18, 1958, p. 501-527.

Reviews literature on production of diffusion coatings to improve corrosion, oxidation or wear resistance of metals. Characteristics of diffusion coatings, types of diffusion mechanism, kinetic and thermodynamic aspects of diffusion processes. Examples of diffusion methods from the gas phase including chromizing of ferrous metals, Ni and Mo; siliconizing of ferrous metals and Mo. 34 ref. (L15; ST, Mo, Cr)

660-L.* Spray Pickling. J. M. Zander. *Canadian Ceramic Society, Journal,* v. 26, 1957, p. 13-16.

Use of sprays in all stages of the process instead of immersion to prepare metal for vitreous enameling. Because of the greater effectiveness of washing action provided by spraying the various solutions under 8 to 12 lb. pressure, a comparable chemical treatment is effected in a much shorter period of time. (L12g)

661-L.* The Protection of Steel Structures in Salt Atmospheres. H. E. Bright. *Corrosion Technology,* v. 5, Jan. 1958, p. 17-20.

Various combinations of processes were used on the Sydney Harbour Bridge. In surface preparation of steel for painting, sand blasting is the best method; red lead is a better rust-inhibiting primer than zinc chromate for imperfectly cleaned steel; tungsten oil phenolic paint vehicle provides a more waterproof paint than alkyd vehicle. Under shade and wet conditions, tung oil phenolic resin vehicle in two-coat finish is outstandingly better, and aluminum spray coating proved to be best. (L26n, R3p; ST)

662-L.* Fresh Look at Plating Problems. *Metal Progress,* v. 74, July 1958, p. 112-114, 146, 148, 150, 153-154, 156.

Improved surface preparation and specialized coatings can ease finishing troubles. Platers should shotpeen the steel prior to chromium plating if fatigue is a factor. Alloy plates, electroless nickel and hard anodizing are solving specific problems. (L17, L-general)

663-L. Electrolytic Deposition of a Tin-Nickel Alloy From Chloride-Fluoride Solutions. K. M. Tyutina and N. T. Kudryavtsev. *Academy of Sciences of the USSR, Proceedings,* v. 115-117, 1957, p. 37-39. (Translation by Consultants Bureau, Inc.)

Following conditions are recommended: electrolyte composition; 2.1-2.5 N $NiCl_2$ + 0.4-0.5 N $SnCl_2$ + 0.7 N NaF + 1.0 N NH_4F; pH = 4.0-4.5. Electrolyte temperature 45-55°. Current density from 0.5 to 4.0 amp. per sq. dm. Current efficiency 96-98%. Sn and Ni anodes with surface ratio $S_{Sn}:S_{Ni}$ = 1:20. Average anode current density 0.5-1.0 amp. per sq. dm. of total anode surface. (L17; *Sn, Ni*)

664-L. Investigation of Cathodic Polarization in Electrodeposition of Nickel-Tungsten Alloys. T. F. Frantsevich-Zabludovskaya and A. I. Zayats. *Journal of Applied Chemistry of the USSR,* v. 30, 1957, p. 764-769. (Translation by Consultants Bureau, Inc.)

Study of the cathode process for electrodeposition of Ni-W alloys from ammoniacal tartrate electrolytes. The alloys are deposited with considerable depolarization relative to W, and with slight depolarization relative to Ni. X-ray structural investigation of the deposits showed that they are single-phase solid solutions of W in Ni. 12 ref. (L17; *Ni, W*)

665-L. Electrodeposition of Gold-Copper Alloys. B. S. Krasikov. *Journal of Applied Chemistry of the USSR,* v. 30, 1957, p. 843-845. (Translation by Consultants Bureau, Inc.)

Practical possibility of obtaining Cu-Au alloys by electrodeposition from cyanide electrolytes. Procedure consists of the production of alloy coatings on Ag cathodes under various conditions, and analysis of the deposits for Cu and Au. In addition, the electrolytes used were also analyzed for Cu, Au and free cyanide. Electrolyte compositions are given. 7 ref. (L17; *Au, Cu*)

666-L. Enamel Defects Caused by Hydrogen. James K. Magor. *Canadian Ceramic Society, Journal,* v. 26, 1957, p. 20-24.

Enamel defects divided into two categories; high-temperature defects, such as blisters, pinholes, pits, blackspecks and copperheads; delayed and low-temperature defects, such as fish scales, shiners, pop-offs and bloats. 7 ref. (L27, 9-68, 9-52, 9-72)

667-L. Cooking Up a Moly Coat. *Chemical Week,* July 26, 1958, p. 62.

Hydrogen reduction of molybdenum pentachloride to yield Mo films. (L28; Mo)

668-L. Efficient Drag-Out Recovery in Barrel Nickel Plating. R. J. Maling. *Electroplating and Metal Finishing,* v. 11, June 1958, p. 184-189, 206.

(L17a; Ni)

669-L. Experiences in Electroplating and Related Processes. J. Chadwick. *Electroplating and Metal Finishing,* v. 11, July 1958, p. 225-228.

Problems in Cd, Zn, Ni and Cr electrodeposition and electroplating and anodizing of Al.
(L17, L19; Al, Cr, Cd, Ni)

670-L. Motor Body Finishing. A. A. B. Harvey. *Electroplating and Metal Finishing,* v. 11, July 1958, p. 233-235, 242.

Repair of metallic paint and Rotodip process of painting sheet metal components. (L16, L23, L26n; 4-53)

671-L. Developments in Chemical Cleaning. D. J. Fishlock. *Electroplating and Metal Finishing,* v. 11, July 1958, p. 239-242.

Properties and applications of Grisiron alkaline cleaners. (L12k)

672-L. Continuous Galvanizing Line. *Engineer,* v. 206, July 18, 1958, p. 102-104.

New line for strip up to 48 in. wide installed at the Ebbw Vale works of Richard Thomas and Baldwins, Ltd., has a potential output of 10 tons per hr. of galvanized steel in the form of coil or sheet. Based on Sendzimir process; fully automatic. (L16, 1-61, 18-67; *Zn,* ST)

673-L. Porcelain Enamels and Ceramic Coatings. Robert J. Fabian. *Materials in Design Engineering,* v. 48, July 1958, p. 103-118.

Survey of types, abrasion, corrosion, high-temperature, thermal, optical and mechanical properties; typical applications of porcelain enamel and ceramic coatings. Definition of terms; factors in design of parts. (L27; NM-g34)

674-L. Annual Conference of the Institute of Metal Finishing, Apr. 16-19, 1958. *Metal Finishing Journal,* v. 4, May 1958, p. 155-180.

Abstracts of papers on Ni plate and anodized coatings on Al. (To be continued.) (L17, L19; Al, Ni)

675-L. Bright Silver Plating. *Metal Industry,* v. 93, July 25, 1958, p. 73-74.

British process produces mirror-bright finish through complete range of coating thicknesses; hard uniform deposits, high ductility. (L17; Ag)

676-L. Progress in Tinplate Lithography. J. Matthews. *Tin and Its Uses,* no. 42, Spring 1958, p. 7-10.

(L26b; SN)

677-L. Steel Mills Look to E3N12's for High Strength in High Heat. *Welding Engineer,* v. 43, July 1958, p. 32-33.

Weld deposited coatings.
(L24, W29h; Ni)

678-L. (Italian.) **Specifications and Layout of an Electroforming Installation. Pt. 1.** Leopoldo Marzano. *Galvanotecnica,* v. 9, May 1958, p. 124-127.

(To be continued.)
(L18, 1-52, 18-67)

679-L. (Italian.) **Specifications and Layout of an Electroforming Installation. Pt. 2.** Leopoldo Marzano. *Galvanotecnica,* v. 9, June 1958, p. 143-150.

(To be continued.)
(L18, 1-52, 18-67)

680-L. (Russian.) **Chemical Coloring of Metal Articles.** I. Finarevskiy. *Promysl. Kooperatsiya,* no. 5, 1956, p. 15-17.

Electrochemical method of color-

ing in a mild galvanic bath, at about 20°. Eleven colors can be produced directly on a steel (or cast iron) surface as well as on Ni-plated and Cu-plated steel, and also on Cu and its alloys. The process requires very low current densities at constant current intensity. (L29; ST, Cu-b, *Ni*)

681-L. (Russian.) **Point Anodizing of Aluminum Alloys.** V. G. Kononenko and D. A. Lyukevich. *Trudy Khar'kovsky Aviatsionnogo Instituta,* no. 16, 1955, p. 27-36.

Procedure for correcting flaws of the oxide film on various parts made of Al alloys, by point anodizing with direct and alternating current in sulphuric acid and chromic acid electrolyte. Method is simple, cheap and dependable under conditions of aircraft production and operation. (L19; Al-b)

682-L.* **Anodic Polarization of Titanium in Nonaqueous Base Etching Solutions.** Morris Eisenberg and Robert E. DeLaRue. *Electrochemical Society, Journal,* v. 105, Mar. 1958, p. 162-169.

Anodic polarization studies, coupled with rate studies as a function of current density, represent a reliable method for determination of the suitability of an electrolyte and of the optimum operational conditions; temperature and current density for anodic etching of Ti without causing a detrimental hydrogen embrittlement of the metal. 7 ref. (L13q; Ti-b)

683-L.* **Finishing Die Castings. Pt. 6. Plating.** E. G. Carlson. *Precision Metal Molding,* v. 16, Aug. 1958, p. 39-41.

The poor performance of Cu, Ni or Cr-plated die castings subjected to outdoor exposure is due to deposits which were thinner than specifications called for. Other reasons for failure include porosity, unsound castings, pitting or porosity in the electroplated deposit itself. Duplex Ni deposits over Cu improve the corrosion properties of the overall plating. (L17; 5-61, Cr, Cu, Ni)

684-L. (Russian.) **Effect of Anodic Passivation Method and Electrolyte Concentration on Porosity of Al_2O_3 Film.** A. F. Bogoyavlenskiy and N. V. Siletskaya. *Zhurnal Prikladnoi Khimii,* no. 8, 1956, p. 1295-1297.

Studies of porosity of anodic Al_2O_3 films formed on sheets of Al (D-16-T) alloy by the sulphuric acid, chromic acid and the carbonate methods. Porosity was determined by filling with mineral oil. Porosity of films formed by the sulphuric acid and carbonate method increases with increasing concentration of the electrolyte, while that of films formed by the chromic acid method is little dependent on the concentration. (L19, 9-68; Al)

685-L.* **Application of the Ion Bombardment Cleaning Method to Titanium, Germanium, Silicon and Nickel as Determined by Low-Energy Electron Diffraction.** H. E. Farnsworth, R. E. Schlier, T. H. George and R. M. Burger. *Journal of Applied Physics,* v. 29, Aug. 1958, p. 1150-1161.

Ion-bombardment cleaning has been successfully applied to the (100) faces of Ge, Si and Ni, and to the (0001) face of Ti. The method is capable of producing surfaces which are atomically clean. (L13, M22h; Ti, Ge, Si, Ni)

686-L. **Can Vacuum Metallizing Replace Plating?** *Metalworking,* v. 14, July 1958, p. 8-9.

(L25g; Al)

687-L. **Phosphating Teatments.** Patent Literature Survey. E. C. Tinsley. Rock Island Arsenal Laboratory. *U. S. Office of Technical Services,* PB 131356, Apr. 1957, 148 p. $3.75.

(L14b, 10-54)

688-L.* **Coatings for Underwater Metal Surfaces in Fresh Water Exposures.** Sol M. Gleser. *Corrosion,* v. 14, Aug. 1958, p. 377t-386t.

Tests to determine effectiveness of coats for underwater metal surfaces on lock and dam components along upper Mississippi River. Data on pigmentation formulas, pigment-vehicle ratios, vehicle composition, preparation of metal surfaces and longevity of primer and finished coats. Suitability of various vehicles, use of coal tar, asphalt, hot spray metal coatings, Al and rubber coatings. 4 ref. (L26a, L26r, L26p, L26n, R4a)

689-L.* (German.) **Present Status of Aluminum Bright Anodizing.** R. Lattey. *Aluminium,* v. 34, July 1958, p. 382-389.

Theoreticl basis of bright (eloxal) anodizing in which Al surfaces are brightened and subsequently anodized without substantial loss of brightness. The uppermost metal layer is removed after mechanical polishing by chemical brightening or anodic solutions. Brightening effect is checked by measurements of reflection and by interference photographs. Important anodic and chemical brightening baths and process procedures. Possible applications. 10 ref. (L12f, L13p, L19; Al-b)

690-L.* (German.) **Chromate Coating of Aluminum.** H. Ketterl. *Aluminium,* v. 34, July 1958, p. 398-405.

Corrosion resistance and other properties of chromte coatings. Performance compared with washed primers. Chromate coatings as base for enameling. Techniques in using Alodine-100 and Alodine-1200 baths. 26 ref. (L14c; Al-b)

691-L.* (German.) **Procedures for Anodizing and Dyeing Aluminum for Architectural Applications. Pt. 1.** G. E. Gardam and A. W. Brace. *Aluminium,* v. 34, July 1958, p. 392-397.

General conditions for anodizing and dyeing structural Al parts. Al alloys suitable for anodizing. Dyes recommended including certain stable inorganic pigments and organic dyes of medium stability. Sealing procedures. Unsatisfactory results of some practical appilcations due mainly to insufficient coating thickness and sealing. (L19n, T26n, 17-57; Al-b)

692-L.* (German.) **Effect of Polishing Materials on Luster in Barrel Polishing.** M. Dreher. *Metallwaren-Industrie und Galvanotechnik,* v. 49, May 1958, p. 188-194.

Changes caused by chemical factors. Metal barrels can produce a harmful electrochemical potential, so barrels of rosin and acid-free aged wood are suggested. Chemical properties of water can influence the result. Choice of polishing compound determined by material of parts. The part surface should be free of oxides, sulphides and stains. The polishing material should not attack the surfaces of the parts or the balls, and should have good antifriction, foaming and emulsifying capacities. All remainders of pickling fluid should be washed way before polishing. (L10d, W3b)

693-L. **Hydrogen Overpotential on Electroplated Copper-Tin Alloys.** I. A. Ammar and H. Sabry. *Journal of Physical Chemistry,* v. 62, July 1958, p. 801-805.

(L17; Cu, Sn)

694-L. **Finishing Big Parts in Barrels.** *Precision Metal Molding,* v. 16, Aug. 1958, p. 43.

A modification of the standard barrel whereby the barrel or chip container is stationary and the workpieces are moved, but movement is not rotational. Parts are fixtured and movement between them and the chip-mass is secured by a reciprocating movement in a horizontal plane. Parts 5 ft. long and weighing from 50 to 52 lb can be finished. (L10d)

695-L. (Russian.) **Point Anodizing of Aluminum Alloys.** V. G. Kononenko and D. A. Lyukevich. *Trudy Khar'kovskogo Aviatsionnogo Instituta,* no. 16, 1955, p. 27-36.

Procedure for correcting flaws of the oxide film on various parts made of Al alloys, by point anodizing with direct and alternating current in sulphuric acid and chromic acid electrolyte. (L19; Al-b)

696-L. **Western Electric's Modern Metal Finishing Plant.** A. W. Cagle and E. J. St. Amand. *Metal Finishing,* v. 56, Aug. 1958, p. 48-52.

Equipment and layout at the new Lexington Rd. plant, Winston-Salem, N. C. (L-general, 1-52, 18-67)

697-L. **Phosphating Treatments. A Comprehensive Patent Literature Survey. Pt. 5.** Ervin C. Tinsley. *Metal Finishing,* v. 56, Aug. 1958, p. 70-72.

Fifty-six U. S. patents briefly annotated. (L14b)

698-L. **Science for Electroplaters. Pt. 39. Organic Acids.** L. Serota. *Metal Finishing,* v. 56, Aug. 1958, p. 73-75, 81.

(L17)

699-L. (Russian.) **Excessive Porosity of Electrodeposited Metals.** Ya. E. Geguzin. *Fizika Metallov i Metalovedenie,* v. 5, no. 3, 1957, p. 536-544.

14 ref. (L17, 9-68; Cu)

700-L. (Pamphlet.) **Bibliography on Electroplating Cobalt and Cobalt Alloys.** F. R. Morral. 16 p. 1958. Cobalt Information Center, Battelle Memorial Institute, 505 King Ave., Columbus 1, Ohio.

Encompasses literature on the electroplating of cobalt and its binary and ternary alloys to June 1957. (L17; Co, 11-67)

Metallography

Constitution and Primary Structures

423-M. **Investigation of Alloys of Magnesium and Their Properties. Pt. 3. Development of Preferred Orientation in Wrought Magnesium Alloys.** S. L. Couling. Dow Chemical Co. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131437, Sept. 1957, 33 p. $1.

A polarized-light metallographic technique capable of supplying in-

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

formation on the orientation of individual grains in a polycrystalline magnesium aggregate was developed and used in several orientation studies. Distribution of preferentially oriented grains in various extruded alloys. Elongated clusters of grains of one orientation alternate with clusters of another orientation throughout much of the extrusion thickness. Imhomogeneous flow or "banding" was found to be an important deformation mechanism during cold rolling of certain alloys and hot compression of alloy cylinders. (M26c, 2-64; Mg-6)

424-M. On the Compound Ni_3B in Nickel-Boron Alloys. N. I. Blok, M. N. Kozlova, M. F. Lashko and K. Ya. Shpunt. *Academy of Sciences of the USSR, Proceedings,* v. 114, 1957, p. 309-311. (Translation by Consultants Bureau, Inc.)

Structure and phase composition of Ni-B alloys containing from 0.01 to 2.5% B. Metallographic investigation of the cast alloys revealed that along the grain boundaries there was formed a uniformly etched phase which constituted a eutectic mixture with Ni. The alloy with 2.5% B is pre-eutectic. This phase has been isolated both chemically and by electrolysis. 4 ref. (M27; Ni, B)

425-M.* Point Defects in Platinum. G. R. Piercy. *Atomic Energy of Canada Limited,* CRMet 782, 68 p.

Mobility and type of point defect introduced in platinum by deformation in liquid nitrogen, quenching into water from 1600° C., or reactor irradiation at 50° C. In all cases the activation energy for motion of the defects was determined from measurements of electrical resistivity. Measurements of density, hardness, and X-ray line broadening were also made. Experiments indicated that the principal defects remaining in Pt after irradiation and quenching are single vacant lattice sites and pairs of vacant lattice sites, respectively. 20 ref. (M26s; Pt)

426-M.* Some Observations on the Identification of Compounds in the System Uranium-Aluminum. R. F. Hills. *Institute of Metals, Journal,* v. 86, June 1958, p. 438-441.

Uranium-aluminum alloys containing more than 31.2% Al exhibit at room temperature an equilibrium structure of (UAl_4 + Al), the amount of UAl_4 being dependent upon the composition of the alloy. Alloys in the range 25.4-31.2% Al should consist entirely of (UAl_3 + UAl_4) with no free Al. The formation of UAl_4 in both these regions can be suppressed by rapid cooling through the critical range. (M24b; U, Al)

427-M.* A Redetermination of the Liquidus of the System Lead-Magnesium in the Range 0-3 Weight Per Cent. Magnesium. G. W. Horsley and J. T. Maskrey. *Institute of Metals, Journal,* v. 86, June 1958, p. 446-448.

Determination was carried out by thermal, metallographic and chemical analysis. The composition of the eutectic lies between 2.25 and 2.30% Mg and its melting point is estimated to be 248.5 ± 0.25° C. 6 ref. (M24b; Pb, Mg)

428-M.* Oxygen Impurity in Silicon Single Crystals. A. Smakula and J. Kalnajs. *Physics and Chemistry of Solids, Journal,* v. 6, July 1958, p. 46-49.

Comparison of the lattice constant and density of "pure" Si crystals and of oxygen-contaminated crystals favors the substitutional position of oxygen in the Si lattice rather than the interstitial. The spectral position and intensities of 15 infrared absorption bands for pure Si crystals are given. The bands shift slightly toward higher frequency at about −130° C., but no narrowing was detected. 25 ref. (M26; Si, *O*, 14-61)

429-M.* Activation Energies for the Production and Migration of Vacancies in Platinum. A. Ascoli, M. Asdente, E. Germagnoli and A. Manara. *Physics and Chemistry of Solids, Journal,* v. 6, July 1958, p. 59-64.

Increases in the resistivity of Pt wires due to quenching are measured, and the activation energy for the formation of vacancies is found to be 1.23 eV. The concentration of vacancies at the melting point is 10^{-4} to 10^{-3}. 12 ref. (M26s, P13a; Pt)

430-M. Preparation of Arc-Melted Uranium Carbides. R. J. Gray, W. C. Thurber and C. K. H. DuBose. *Metal Progress,* v. 74, July 1958, p. 65-70.

Uranium carbides are promising materials for Al reactor fuel elements requiring high uranium investments, particularly for the Atoms-for-Peace Program, where the U^{235} enrichment is limited to 20% Al-U carbide fuel plates, fabricated by the picture-frame technique, retain their dimensional tolerance during heat treatment. Microstructures illustrated. (M27d, M21, T11g, 17-57; U, 14-68)

431-M. Electron Microscope as a Metallurgical Tool. William MacFarlane. *Royal College of Science and Technology, Metallurgical Club, Journal,* no. 10, 1957-1958, p. 31-34.

9 ref. (M20r, M21e, 9-72; ST)

432-M. Phases of the Tungsten-Boron System. G. V. Samsonov. *Academy of Sciences, Proceedings,* v. 113, 1957, p. 417-419. (Translation by Consultants Bureau, Inc.)

11 ref. (M24b; W, B)

433-M.* (French.) **Preparation of Uranium Monocarbide and Its Relation to the Carbides of Refractory Transition Metals.** H. Nowotny, R. Kieffer and F. Beneslovsky. *Revue de Metallurgie,* v. 55, May 1958, p. 453-458.

The monocarbide of uranium is of interest as a fuel in reactors. Solid solutions with other refractory carbides of groups 4a and 6a of the periodic system are characterized by great stability. Specimens obtained by fritting under pressure and examined by X-ray. A complete series of solid solutions is found in the UC-ZrC, UC-TaC and UC-CbC systems. Uranium carbide is also a good solvent for other carbides, particularly for VC, but its solubility is small. 11 ref. (M24c, T11g; U, C, Cb, Ta, Zr, 14-67)

434-M. (Russian.) **Aluminum-Tantalum Systems.** V. M. Glazov, M. V. Mal'tsev and Yu. D. Chistyakov. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk,* no. 4, 1956, p. 131-136.

Aluminum corner of the Al-Ta system investigated by microstructural, macrostructural, thermal and X-ray refraction methods. Alloys containing from 0.01 to 5.1% Ta were homogenized at 500° for one week and annealed in stages at temperatures from 200 to 630°, 40 hr. at each temperature. Dependence on alloy composition of the number of grains per sq.cm. of the surface of a macroscopic slide, of the microscopic hardness of the solid solution and the macroscopic hardness. (M24b; Al, Ta)

435-M. (Russian.) **A Microscopic and X-Ray Study of Cobalt-Antimony Alloys.** N. N. Zhuravlev. *Kristallografiyal,* no. 5, 1956, p. 506-508.

Alloys up to 50 at.% Co were produced under an Ar atmosphere in quartz ampules. $CoSb_3$ has a b.c.c. unit cell with a = 9.016 ± 0.003 kX; its structure belongs to one of two X-ray groups m_1 or m_3mF. The existence of the compounds CoSb and $CoSb_2$ was also established. Microhardness and specific gravity were measured for $CoSb_3$, $CoSb_2$ and CoSb. (M26; Co, Sb)

436-M. (Ukrainian.) **Structure of a Liquid Bismuth-Tin Alloy.** O. S. Lashko. *Dopovidi Akademii Nauk Ukrains'koi S.S.R.,* 1957, p. 30-32.

From an X-ray study of liquid eutectic Bi-Sn alloy it was possible to construct monochromatic curves for the intensity of scattered radiation and curves for atomic distribution at 150 and 400°. At 150° the first maximum on the atomic-distribution curve occurs at 3.3 Å; at 400° it is displaced to 3.5 Å. Analysis of the curve points to the existence in the liquid alloy of small regions composed predominantly of atoms of one kind. At 150° the coordination number for Sn atoms is 10 and for Bi atoms 8. (M25; Bi, Sn, 14-60)

437-M. (Ukrainian.) **Ternary Solid Solutions in the System Copper-Magnesium-Cadmium.** S. S. Cherkashin, P. I. Kripyakevich and D. P. Frankevich. *Dopovidi Akademii Nauk Ukrains'koi S.S.R.,* 1957, p. 33-37.

Alloys containing 10-66.7 at. % Cu were investigated by metallographic and X-ray methods. Ternary solid solutions are based on certain binary compounds in the systems Cu-Mg and Cu-Cd. The compound Cu-Mg dissolves about 6 at.% Cd at 400°; at the same time the lattice parameter in the solid-solution field increases from 7.018 (for Cu_2Mg) to 7.040 ± 0.001 kX as a result of the replacement of the Cu atoms by Cd atoms, which have a larger size. The maximum solubility of Mg in the compound $CuCd_3$ is 48 at.%. (M24c, Cu, Mg, Cd)

438-M.* Direct Observation of Dislocations and Their Movement in Metal Foils. P. B. Hirsch, R. W. Horne and M. J. Whelan. *Electron Microscopy, Proceedings of the Stockholm Conference,* Sept. 1956, p. 312-315.

Examination of dislocation structure (specifically Al) by transmission electron microscopy. 14 ref. (M21e, M26b, M26n; Al)

439-M. Phase Analysis of Alloys Using the Radioactive Tracer Method. E. Z. Vintaikin, P. L. Gruzin, Yu. A. Klyachko and A. P. Shotov. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 179-184. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Procedure for determining chromium content in Cr-steel carbides, using the artificially radioactive isotope

Cr^{51}. Relative error is 5-6%. Method makes it possible to obtain data on kinetics of carbide formation in the tempering of hardened Cr steel. The increase in Cr concentration in the carbide follows a straight line when plotted against the logarithm of the annealing time. 8 ref.
(M23q, N8a; ST, Cr, 14-63)

440-M. Thermodynamics of Crystal Lattices With Vacancies. N. S. Fastov. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 265-274. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Under the effect of heat motion a number of atoms leave their positions in the crystal lattice and pass into intermediate positions either on the surface of the crystal or in internal microporosities. The result of this motion is the appearance of vacant positions (vacancies or holes) in the crystalline lattice. 8 ref.
(M26s)

441-M. X-Ray Determination of the Characteristic Temperature of Chromium, Nickel and Molybdenum. V. A. Ilyina and V. V. Kritskaya. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 275-276. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

The magnitude of interatomic binding forces in crystals is reflected by such constants as melting point, heat of sublimation, activation energy of self-diffusion and diffusion, characteristic temperature and elasticity modulus. These characteristics determine the materials capacity for maintaining regular crystalline structure. The binding forces in Cr, Ni, Mo and Fe were determined by measuring the thermal factor of the intensity of X-ray interferences. The characteristic temperature was calculated from this factor.
(M25h; Cr, Ni, Mo, Fe)

442-M. Investigation of the Variation of Intensity of X-Ray Interference Lines of Deformed Steel. V. A. Ilyina and V. K. Kritskaya. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 294-298. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Influence of plastic deformation on crystalline lattice. The intensity of X-ray reflections is considerably lower from deformed metals than from undeformed metals. Measurements at two temperatures (+23° and −185°) showed that the change in intensity (thermal intensity coefficient) resulting from a 200° reduction in temperature of the specimen varies equally for both deformed and undeformed iron. 10 ref. (M26, M22g, Q24; ST)

443-M.* (Czech.) **Potentiostat in Metallography.** Vladimir Cihal, Milan Prazak and Miroslav Holinka. *Hutnicke Listy,* v. 13, 1958, p. 496-502.

Problems of metallographic etching under conditions of controlled potential. Proposes potential values for selective etching of ferrite sigma phase, austenite and austenitic grain boundaries in 18-8 on basis of characteristic polarization curves of the individual phases. 14 ref.
(M20q, X25h; SS)

444-M. (Russian.) **Equilibrium Diagrams of Ternary System Ni-Cr-W.** I. I. Kornilov. *Zhurnal Neorganicheskoi Khimii,* no. 4, 1957, p. 860-867.

Alloys containing up to 50% Cr and 30% W were studied by thermal and X-ray methods and by microstructure analyses. Increase in Cr content decreases the temperature of the start of crystallization, and alloys containing more than 40% Cr crystallize at 1350° as eutectic mixtures. The solubility of Cr in the solid solution of Ni containing 30% W is considerably less than in alloys with 10% W at all temperatures. (M24c; Ni, Cr, W)

445-M. (Russian.) **Interaction of Titanium Carbide With Metals of Iron Group.** V. N. Yeremenko. *Zhurnal Neorganicheskoi Khimii,* no. 9, 1956, p. 2131-2148.

Systems TiC-M(Ni, Co, Fe) were studied by thermal, metallographic, dilatometric, durometric (hardness measurement) and X-ray methods, and diagrams in the metal-rich range were plotted. The systems are of the eutectic type with limited TiC solubility. In the system TiC-Ni, eutectic is at 1280° and 9.3% TiC; the solubility of TiC in Ni is 6.2% at this temperature and 2% at 700°. In the system TiC-Co, eutectic is at 1360° and 6% TiC. Solubility of TiC in Co drops from 1% at 1360° to 0.15% at 700°. In the system Ti-Fe, eutectic is at 1460° and 3.8% TiC. (M24c; Ti, Ni, Co, Fe, C)

446-M. X-Ray Investigation of Interatomic Reactions in Solid Solutions With a Nickel Base. G. V. Kurdyumov and N. T. Travina. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 277-280. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Materials studied consisted of binary solid solutions of Ni with Cr, Ti or Al or quaternary Ni-Cr-Ti-Al alloy with the second phase separating from it during the disintegration of the solid solution. For a given atomic concentration the greatest increase of the binding strength is caused by Ti, next by Al and the smallest by Cr. The simultaneous effect of these three elements leads to a greater increase of interatomic binding strength than the individual effect in binary solid solutions.
(M25l; Ni-b, *Cr, Ti, Al*)

447-M. Effect of Chromium on the Binding Forces in α-Iron Crystals. V. K. Kritskaya, G. V. Kurdyumov and T. I. Stelletskaya. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 281-283. (Available from U. S. Office of Technical Services, Washington, 25, D. C.)

Three Fe-Cr alloys containing 2, 8 and 16% Cr were investigated. The characteristic temperature and the variation of mean square deviation during thermal oscillations of atoms in the lattice of the solid solution were determined from the thermal factor of X-ray scattering by measuring the intensity of X-ray reflections at two different temperatures.
(M25h, 2-60; Fe, *Cr*)

448-M. Binding Forces and Statistical Deformations in the Lattice of Alloyed Ferrite. V. A. Ilyina and V. K. Kritskaya. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 284-288. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

To study the effect of alloying elements on the variation of binding forces in ferrite crystals and on the magnitude of the statistical deformations of the lattice of the solid solution, alloys containing small amounts (up to 2%) of Mo, Cb, Mn, Co and V, were used. Measurements showed that, with the exception of V, all the alloyed elements increase the binding forces in ferrite crystals. 5 ref.
(M25h, 2-60; Fe-b *Mo, Cb, Mn, Co, V*)

449-M. Quasi-Binary Nature of a System of a Six-Component Nickel-Base Solid Solution With Titanium Carbide. I. I. Kornilov. *Doklady Akademii Nauk SSSR,* v. 119, no. 3, 1958, p. 501-503. (Henry Brutcher, Altadena, Calif., Translation no. 4269.)

Simplifying study of multicomponent metallic systems by reducing them to equilibrium among a limited number of phases (e.g. three). Eight-component system Ni-Cr-W-Mo-Cb-Ti-Al-C phase diagram obtained.
(M24d; Ni, Cr, W, Mo, Cb, Ti, Al, C)

450-M. (Russian.) **Chemical Nature of Ternary Intermetallic Phases in Systems Magnesium-Copper-Zinc and Magnesium-Copper-Nickel.** V. I. Mikheyeva and G. G. Babayan. *Doklady Akademii Nauk SSSR,* no. 4, 1956, p. 785-786.

The existence of chemical compounds MgCuZn and MgCuNi was established by measuring the electric resistance and its temperature factor in the regions of homogeneity of the solid phase in the systems Mg-Cu-Zn and Mg-Cu-Ni. The solid phases of these systems may be considered as ternary berthollides—phases containing the above-mentioned compounds in the state of dissociation or in the state of change of component valence.
(M24c; Mg, Cu, Zr, Ni)

451-M. (Russian.) **X-Ray Diffraction of Compounds in the Bi-Rh and Bi-Pd Systems in Connection With Superconductivity.** N. N. Zhuravlev and G. S. Zhdanov. *Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya,* no. 6, 1956, p. 708-713.

Bi-Rh system contains three intermetallic compounds: Bi-Rh, Bi_2Rh and Bi_4Rh. For isolated crystals of these compounds, data are determined on their crystalline structure, and also certain physical properties, including the temperature of transition to the superconducting state. (M22g, M24b; Bi, Rh)

452-M. (Russian.) **Phase Diagram of Binary System Titanium-Aluminum.** I. I. Kornilov, Ye. N. Pylayeva and M. A. Volkova. *Izvestiya Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk,* no. 7, 1956, p. 771-778.

Thermal, microstructure and X-ray diffraction methods, also analysis of hardness and heat resistance. Occurrence of peritectic transformations has been ascertained at 1520° (beta) + melt ⇄ gamma and at 1400° (gamma + melt ⇄ $TiAl_3$) and also a peritectoidal reaction at 1300° (beta + gamma ⇄ alpha). Solubility of Al in Ti at 1200° and 800° is, respectively, 26 and 21.6%.
(M24b; Al, Ti)

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

453-M. (Russian.) **Intermetallic Alloys of Platinum and Gold With Alkali and Alkaline-Earth Metals.** I. L. Sokol'skaya. *Zhurnal Tekhnicheskoi Fiziki,* no. 1, 1957, p. 127-129.

Study of specimens from the systems Na-Au, Na-Pt and Ba-Pt produced by heating a Au film in Na vapor by evaporating Pt in Na vapor, and by condensing Ba and Pt in a vacuum. The compound Na-Au proved to be a typical semiconductor with an exponential temperature dependence of resistance and an activation energy of 0.15 eV. In the systems Na-Pb and Ba-Pt, the existence of compounds could not be taken as fully demonstrated, though the experimental results support the assumption to a considerable extent.
(M24b, P15g; Na, Au, Pt, Ba)

454-M.* (French.) **Use of Bromine in Electron Metallography.** G. Henry, J. Pleatau and J. Philibert. *Comptes Rendus,* v. 246, May 12, 1958, p. 2753-2756.

Use of bromine as agent of dissolution of matrix of ferrous alloys, for preparation of direct carbon replicas; separation of replicas; methods of extraction, identification and analysis of precipitates and inclusions. (M20r, M21e)

455-M.* (Russian.) **X-Ray Study of Metallic Structure After Electro-Spark Treatment.** K. F. Starobudov and B. P. Kolesnik. *Fizika Metallov i Metallovedenie,* v. 5, no. 5, 1957, p. 434-441.

Study of phase changes and microhardness of surface layers of more than 100 combinations of V, Mn, Zr, Nb, C, Al, Fe, Ni, Cu, Zn, Cd, Sn, Pb and Bi, after electro-spark treatment. 9 ref.
(M21f, M27, G24a, Q29q)

456-M.* (French.) **Equilibrium Diagram of Uranium-Iron for Low Concentrations of Iron.** J. Bellot, A. Blanchon, R. Chazot, P. Dosiere, J. M. Henry and M. Colas. *Comptes Rendus,* v. 246, May 28, 1958, p. 3063-3065.

Study of U-Fe equilibrium diagram for alloys containing less than 0.3% Fe, with particular attention to curve of solubility of Fe in beta uranium. (M24b; U, Fe)

457-M. (Ukrainian.) **Revision of the Constitutional Diagram of the Iron-Arsenic System.** V. N. Svechnikov and A. K. Shurin. *Dopovidi Akademii Nauk Ukrains'koi S.S.R.,* no. 1, 1957, p. 27-29.

Study of Fe-As alloys containing 0.016-0.020% C and up to 12.6% As. Shape of liquidus and solidus curves and position of the two-phase (alpha + gamma) field establish that Fe-As alloys belong to the series with closed gamma-loop. The As contents of the gamma and alpha phases at the temperature of maximum solubility of As in ferrite (1150° C.) are 1.75% and 2.4% respectively. (M24b; Fe, As)

458-M. (Ukrainian.) **Study of a Polythermal Section of the Constitutional Diagram of the Ternary System Ti-Fe-C.** V. N. Eremenko, V. M. Bulanov and L. O. Gaevskaya. *Naukovi Zapiski Kievskogo Instituta,* no. 13, 1956, p. 119-124.

The TiC-Fe constitution diagram was studied in the region up to 16% TiC, by thermal, metallographic, dilatometric and X-ray structural analysis. The eutectic in the TiC-Fe system is at 1460° C. and 3.8% TiC. TiC increases the temperature of the gamma to alpha transformation in Fe, leading to the peritectoid reaction gamma (0.04% Ti) + TiC $\rightarrow$ alpha (0.15% TiC) at 920° C. Alloys containing more C than indicated in the ideal section TiC-Fe undergo eutectoid transformation at 695° C. Literature reviews on the systems Ti-Fe, Ti-C and TiC-Fe. 38 ref. (M24c; Ti, Fe, C)

459-M. Electropolishing and Electro-Etching of Microsections of Iron-Copper Powder Compacts. O. K. Teodorovich and E. T. Kachkovskaya. *Zavodskaya Laboratoriya,* v. 24, no. 1, 1958, p. 57-60. (Henry Brutcher, Altadena, Calif., Translation no. 4194.)

Previously abstracted from original. See item 223-M, 1958.
(M20p, M20q; 6-70)

460-M. (Czech.) **Electron Microscopy.** Ivan Hrivnak. *Hutnické Listy,* v. 13, 1958, p. 526-531.

Methods used in preparation of replicas of steel samples. Preparation of colloidion, polystyrene and carbon extraction replicas. Emphasizes electrolytic method of preparation in $HC10_4$ solutions. 12 ref.
(M20r, M21e; ST)

461-M. (French.) **Structure of the Low-Temperature Au_2Mn Phase.** Pierre Michel. *Comptes Rendus,* v. 246, May 5, 1958, p. 2632-2635.

5 ref. (M26q; 14-68, Au, Mn)

462-M. Twinned Epitaxy of Copper on Copper. Theodore H. Orem. *National Bureau of Standards, Journal of Research,* v. 60, June 1958, p. 597-608.

Study of X-ray diffraction of Cu electrodeposited on various faces of Cu monocrystals. Electroplate in some cases followed orientation of base crystals, in others, twinning occurred. 10 ref.
(M26c, N12d; Cu, 8-62)

463-M. (Chinese.) **Diffraction of X-Rays From Aluminum Single Crystals While Under Tension.** Yui Zhui-Khuan, Li Yui-Tszi, Tsui Khuei-Tszun and Se Kuan-Tsun. *Acta Scientia Natura,* no. 2, 1956, p. 185-202.

Al single crystals stressed in tension to various degrees of strain were studied by the Laue method. The effect of stress on the crystal appears to a much greater degree on Laue photographs obtained by back-reflection. At the outset of the stress process the asterism of the Laue spots is increased but at greater stress, saturation sets in. In back-reflection Laue photographs, the Debye diffraction rings are clearly defined while in photographs taken in the transmitted beam these rings are not observed even at stress of 70%. It is concluded that during stress the crystal undergoes regular rotation of the crystallites which form due to the stress.
(M22g; Al, 14-61)

464-M. (Russian.) **Existence of Sigma and Chi Phases in Rhenium Alloys.** Ya. Nemets and V. Tzhebyatovskii. *Byul. Pol'skoi Akademii Nauk,* Pt. 3-4, no. 9, 1956, p. 591-593.

X-ray study of binary alloys of Re with Cb, Ta, Cr, Mo, and Fe. The alloys were prepared by sintering the pure components in a stream of pure H_2 or by melting in an arc furnace under an Ar atmosphere. Chi phases occur in the alloys with Cb and Ta. For the structural formula $Re_{22}Cb_7$, the positions of the atoms in the unit cell were verified on the assumption that they were equal to the co-ordinates of alpha-Mn. (M26; Re)

465-M. (Russian.) **Effect of Titanium on the Structure of Iron-Cobalt-Aluminum Alloys.** N. A. Galaktionova and F. B. Nikishova. *Fizika Metallov i Metallovedeniye,* no. 3, 1955, p. 506-509.

Investigation of the structure of Alnico-5 type alloys with addition of Ti (0.8-5%) after hardening (cooling from a temperature of 1300° in a magnetic field at the critical speed), in high-coercive state after tempering.
(M27d, 2-60; SGA-n, Fe, Co, Al, *Ti*)

466-M. (Russian.) **Use of X-Ray Structural Analysis in the Study of Some Problems of Deformation and Recrystallization Textures.** Yu. M. Loiko. *Sbornik Nauchnykh Trudov Fiziko-Tekhnicheskogo Instituta Akademii Nauk Byelorusskikh SSSR,* no. 3, 1956, p. 169-177.

Effect of temperature, degree and speed of deformation on the formation of deformation texture and recrystallization texture. Specimens of Ni, steel 45, Armco Fe, Fe-Ni-C alloys (20-80% Ni and 0.4% C), Cu and Al were tested at 50-100° C. intervals by compression under static and impact loading while at each temperature various degrees and speeds of deformation were used.
(M26c, 2-61, N5, Q24)

467-M. (Russian.) **Rhenium and Its Alloys.** Ye. M. Savitskiy and M. A. Tylkina. *Issledovaniya po Zharoprochnym Splavam. M., Akademii Nauk SSSR,* 1956, p. 33-47.

Properties of Re and its alloys with Mo (over the entire range of concentration) obtained by arc melting in an argon atmosphere. All specimens were subjected to metallographic and X-ray diffraction analysis and to a hardness measurement at temperatures of −194, 200, 400, 600, 800, 1000, and 1150° C. in an argon atmosphere; plasticity was determined at 20 and 1000° C.
(M24b, Q-general; Re, *Mo*)

468-M. (Russian.) **Investigation of the Palladium-Copper-Cobalt System.** A. T. Grigor'ev, L. A. Panteleymonov, V. V. Kuprina and L. I. Rybak. *Zhurnal Neorganicheskoi Khimii,* no. 5, 1956, p. 1067-1073.

The mutual solubility of Cu and Co increases with increasing Pd contents. The heterogeneous region of the Cu-Co system is transformed into a triple system at room temperature, is gradually reduced with increasing content of Pd in the alloys and is closed at approximately 55% Pd. (M24c, Pd, Cu, Co)

469-M. Preferred Orientation of Cold-Rolled and Recrystallized Uranium Plate. W. R. McDonell. *U. S. Atomic Energy Commission DP-258,* 1958, 20 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.75.

Preferred orientation induced by mild cold rolling after beta transformation was characterized by measurement of thermal expansion coefficients. It was estimated that cold reductions of 5 and 10% would cause elongations of one and two per thousand MWD/T, respectively, during irradiation of the plate. Recrystallization following cold work did not significantly affect the preferred orientation, but relieved in-

tergranular stresses in the metal. The cold work and recrystallization reduced the grain size of the metal. (M26c; U, 4-53)

470-M. Preparation of Metallographic Specimens Through Vibratory Polishing. E. L. Long and R. J. Gray. *U. S. Atomic Energy Commission ORNL-2924*, 1958, 15 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

In contrast to the commercially available automatic polishers, vibratory polishing is a continuous process. As many as 24 specimens can be polished simultaneously and overpolishing is less likely to occur. (M20p)

471-M. (Russian.) **Investigation of the Structure of Magnesium Alloys Containing Calcium, Using Radiographic Methods.** M. Ye. Drits, Z. A. Sviderskaya and E. S. Kadaner. *Issledovaniya po Zharoprochnym Splavam. M., Akademii Nauk SSSR*, 1956, p. 84-90.

Investigation using Ca^{45} on macro and microstructures of Mg-Ca, Mg-Mn-Ca, Mg-Mn-Al-Ca alloys. Macrostructure indicates that crystallization has a dendrite character. Increasing Ca content increases the irregularity of its distribution in the alloy.
(M28h, M27, 1-59; Mg-b, *Ca*)

472-M. (Russian.) **Reaction of Titanium Carbide With Nickel.** V. N. Yeremenko, V. M. Polyakova and Z. P. Golubenko. *Sbornik Voprosy Poroshkovoy Metallurgii i Prochnosti Materialov*, v. 3, 1956, p. 62-72.

Thermal analysis, metallographic and radiographic methods were used in establishing the equilibrium diagram for the system Ni-TiC in the Ni-rich region. Solubility of TiC in Ni in the solid state was determined. (M24; Ni, Ti)

473-M. (Russian.) **Use of a Capacitative Dilatometer for Studying Phase Transformations in High Speed Heating.** I. N. Kidin and A. V. Panov. *Zavodskaya Laboratoriya*, v. 23, no. 1, 1957, p. 48-52.

Apparatus for recording dilatometric curves in the study of phase transformations in steels, by which changes in length of the heated specimen can be recorded over heating rates of from 1 to 10,000° C. per sec. Temperatures were measured with couples, spot welded to the specimen at 0.5 to 1.0-mm. intervals. (M23b, 1-53)

474-M. On the Influence of Intermolecular Interaction on the Behavior of Solutions. D. S. Kamenetskaya. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission*, AEC-tr-2924, 1958, p. 42-51. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Molecular interaction of the components in the solution materially affects the behavior of solutions; type of condition diagram, boiling and melting points, vapor pressure of components and the disposition of the components between the solvent phases or two contiguous solutions. 7 ref. (M25, P12; 14-67)

475-M. New Type of Preparation for Electro-Microscopic Investigation of Dispersed Structures of Two-phase Alloys. A. I. Rizol and L. M. Utevsky. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission*, AEC-tr-2924, 1958, p. 205-210. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Replica preparation for phase analysis. (M21e, M24)

476-M. X-Ray Analysis of the Carbide Phase of Patented Steel Wire. V. M. Golubkov and V. K. Kritskaya. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission*, AEC-tr-2924, 1958, p. 322-325. (Available from U. S. Office of Technical Services, Washington 25, D. C.; also available as Henry Brutcher, Altadena, Calif., Translation no. 3950.)

Previously abstracted from original. See item 353-M, 1957.
(M26r, M22g; ST, 4-61)

477-M.* Dislocations in Stainless Steel. W. Bollmann. *Electron Microscopy, Proceedings of the Stockholm Conference*, Sept. 1956, p. 316-318.

Direct observation of dislocation movements in 18-8 Cr-Ni steel by electron microscopy techniques. 8 ref. (M26b, M22b; SS)

478M. On Texture in Iron Scale. Pt. 9. Electron Diffraction Investigation of Textures in the Haematite Layer at Different Stages of the Oxidation of Iron in Air. V. I. Arkarov and B. S. Borisov. *Physics of Metals and Metallography*, v. 4, no. 1, 1957, p. 58-64. (Translation by Pergamon Institute.)

Previously abstracted from original. See item 371-M, 1957.
(M26c, R1h; Fe, 9-52)

479-M. (Czech.) **Isolation of Carbides From Steel.** V. Toman, H. Tuma and N. Tietz. *Hutnicke Listy*, v. 11, no. 12, 1956, p. 738-740.

Preparation of the specimens, isolation and chemical analysis of the carbides, preservation of the carbides isolated and final analysis of the results. The shape and pretreatment of the specimens depend on the isolation method selected, but their surfaces must always be clean and edges rounded. Composition of, and method of using, electrolytes for anodic solution of the specimen; effects of electrolyte (composition), time and temperature on the analytical results. (M23, M26r; ST)

480-M. (Russian.) **Investigation of the Ni-S System From 30 to 50 At. %.** S. M. A. Sokolova. *Doklady Akademii Nauk SSSR*, v. 106, no. 2, 1956, p. 286-289.

The existence of the compound NiS in two forms is confirmed. Ni-rich alloys show metallic conductivity, while the alloys rich in S approach the semiconductor conductivity values. (M24b; Ni, S)

481-M. (Russian.) **Investigation of Alloys of the Palladium-Cobalt-Nickel System.** A. T. Grigor'yev, L. A. Pantelevmonov, Ye. M. Sokolovskaya, T. V. Bunina and M. V. Mastvugina. *Izvestiia Sektora Fiziko Khimicheskogo Analiza Institut Obschchei i Neorganicheskoi Khimii imeni Akademiia Nauk SSSR*, v. 27, 1956, p. 185-197.

Microstructure, hardness and electric resistance determined. Shape of liquidus and solidus curves of sections with constant Pd content and microstructure of the alloys indicate that the components of the ternary system Pd-Co-Ni form a continuous series of solid solutions. (M24c, M27, P15g, Q29n; Pd, Co, Ni)

482-M. (Russian.) **Equilibrium of Chemical Heterogeneity in Metallic Alloys at High Temperatures.** V. N. Svechnikov and B. A. Movchan. *Nauchnye Raboty Instituta Metallofiziki, Akademii Nauk Ukrainskoii SSR*, no. 7, 1956, p. 32-47.

Study of the distribution of W and Cr in steel KhVG in a condition of superheat by X-ray, microanalysis and autoradiography. Heating was carried to 1200, 1300 and 1400° C. and held for 30 min. in a protective atmosphere and under vacuum. After heating to 1400° C. the content of W at the surface of an intercrystalline fracture was more than twice the mean content of W in the steel. Micro X-ray analysis showed that the joints of the grains were enriched with Cr and W. Distribution of P in carbon steel, containing 0.04-0.25% C, by the process of homogenization was also studied.
(M27, 2-64, AY, *Ce, W, P*)

483-M.* (Russian.) **Formation of Texture During High-Temperature Annealing of Cold Rolled Transformer Steel.** G. N. Shubin and L. V. Mironov. *Stal'*, v. 18, July 1958, p. 648-650.

Experimental confirmation of the significance of converging crystallization as a base for increasing the intensity of texture, and of the specific role played by secondary recrystallization, the parameters of which depend on heat treatment conditions of steel and determine the development of anisotropy of magnetic properties. On the basis of these experiments it is possible to recommend that to obtain steel of low anisotropic magnetic properties the annealing should be conducted very rapidly (200-250° C. per min.). (M26c, J23, P16; AY, SGA-n)

484-M. Electonic Structure of Nickel and Its Alloys. G. S. Krinchik. *Physics of Metals and Metallography*, v. 4, no. 1, 1957, p. 26-29. (Translation by Pergamon Institute.)

Previously abstracted from original. See item 370-M, 1957.
(M25, P16; Ni)

485-M. (Russian.) **Calculating the Pattern of X-Ray Emission Spectrums of "Ordered" Alloys.** A. N. Orlov and A. V. Sokolov. *Fizika Metallov i Metallovedenie*, v. 5, no. 3, 1957, p. 390-394.

10 ref. (M22g)

486-M. (Book.) **Constitution of Binary Alloys.** Max Hansen and Kurt P. Anderko. 1305 p. 1957. McGraw-Hill Book Co., 330 West 42nd St., New York 36, N. Y. $32.50.

Phase diagrams and crystal structure of metallic phases. (M24, M26)

Transformations and Resulting Structures

389-N.* A Review of Diffusion in Aluminum. J. W. H. Clare. *Metallurgia*, v. 57, June 1958, p. 273-278.

Methods of investigation and data on diffusion in Al alloys. Possible sources of error introduced during experimental work. 31 ref.
(N1, Al)

390-N. Recrystallization Diagram of Molybdenum. E. M. Savitsky, V. V. Baron and K. N. Ivanova. *Academy of Sciences of the USSR, Proceedings*, v. 113, 1957, p. 355-358. (Translation by Consultants Bureau, Inc.)

Relationship of grain size to degree of deformation and annealing temperature. Above 1300° recrystallization was observed in all deformed and annealed samples. Grain growth at the critical degree of deformation

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

occurred from 1400° (10% deformation). An increase in temperature led to still more intense grain growth, maximum grain size being observed at 7.5% deformation for 1530° and at 2.5% deformation for 1730°, while at higher deformations and the same annealing temperature (1530°, 70%) grain size was considerably less. 4 ref.
(N5, N3, M27c; Mo)

391-N.* (French.) **Theories on the Formation of Spheroidal Graphite.** M. Ferry. *Metaux - Corrosion - Industries*, v. 33, May 1958, p. 193-211.

Mode of formation of lamellar graphite. Examination of theories on formation and development of spheroidal graphite; indirect formation by decomposition of pre-existing cementite; direct formation from liquid state; precipitation from solid solution of austenite supersaturated with carbon. 62 ref. (N8q)

392-N.* (Japanese.) **Calcium Treated Cast Iron. Pt. 2. Effect of Calcium-Silicon on the Graphitization of Low-Carbon Iron-Carbon Alloys.** Masuteru Maruyama and Mitsuru Ito. *Japan Foundrymen's Society, Journal*, v. 30, June 1958, p. 479-487.

Graphitization was studied from the point of view of microstructure and the graphitization ratio of castings cast into CO_2 molds. Graphitization temperature of low-carbon Fe-C alloy treated with Ca-Si was considerably lower than that of plain Fe-C alloy, and even in the range of steel compositions, it was between 600 and 800° C., being under the A_1 transformation temperature. Stability of cementite, in the range of low-carbon composition, was remarkably lowered by the effect of calcium. Diffusion of calcium into molten iron progressed with the lowering of carbon content. 11 ref.
(N8s; CI, *Ca, Si*)

393-N. Effect of Impurities on the Production of Crystallization Nuclei in Supercooled Liquids. D. S. Kamenetskaya. Paper from "Growth of Crystals", Consultants Bureau, Inc., 1958, p. 33-38.

Crystallization centers form in pure liquids at high degrees of supercooling which are determined by the surface tension at the crystal-liquid interface. The absence of much supercooling in practice is due to active insoluble particles and small amounts of surface-active impurities. The mechanism by which insoluble and soluble impurities act differ: the insoluble act as pre-existing centers; small amounts of soluble impurities materially influence the rate of center formation, which is a consequence of their influence on surface tension and on the activation energy of center formation. 14 ref. (N12n, 3-69)

394-N. Effect of Impurity Diffusion in the Melt on the Distribution in the Crystal During Directed Crystallization. A. I. Landau. Paper from "Growth of Crystals", Consultants Bureau, Inc., 1958, p. 58-64.

The axial distributions of small impurities in single crystals growing from melts are studied as functions of initial concentration, diffusion coefficient in the melt, rate of crystal growth and equilibrium purification factor. Equations in partial derivatives are derived which describe the impurity distribution in the melt at any time; methods of solution indicated. 7 ref. (N3r; 3-69)

395-N. Thermal and Diffusion Processes in Crystal Growth. G. P. Ivantsov. Paper from "Growth of Crystals", Consultants Bureau, Inc., 1958, p. 76-85.

The crystal growth rate is determined by the rate of latent heat removal and by the capacity of the substance to crystallize at a definite linear velocity under set conditions (temperature and surface orientation). When the crystal is small and the growth rate very small the system will be isothermal, the effect of uneven temperature distribution will be vanishingly small, and the crystal will adopt a polyhedric shape close to the equilibrium one. If the substance has a high linear crystallization rate and heat removal is rapid a temperature difference will result and "incorrect" growth forms will occur—needles and dendrites. 6 ref. (N12)

396-N. Some Aspects of Crystal Growth in New Phases Arising in Solid Solutions of Metals Observed in the Electron Microscope. N. N. Buinov. Paper from "Growth of Crystals", Consultants Bureau, Inc., 1958, p. 94-100.

Recrystallization in supersaturated solid solutions inclined to decompose does not occur by new phase nucleation but by the development of submicro regions enriched in alloying component already present in the quenched alloy. The nature of the solid-state crystallization is determined by zone enrichment, followed by enrichment of particles of metastable alloying component phases. The transition from zones to particles of metastable and stable phases occurs allotropically. 18 ref.
(N5f, N12p)

397-N. Effects of Modifiers on the Recrystallization of Castings. V. E. Neimark and A. I. Dukhin. Paper from "Growth of Crystals", Consultants Bureau, Inc., 1958, p. 101-108.

Boron and titanium have different actions on crystal growth in carbonaceous steels: B restricts columnar crystal growth, Ti facilitates the growth of very thin columnar crystals. When the melt crystallizes in 50-mm. diameter molds B and Ti retard columnar crystal growth in Kh-27 and have no material influence on crystal growth in Kh18N9. Increased heat removal (increased supercooling at the crystallization front) causes the modifiers to have more influence on the nucleation rate in austenitic steel. 10 ref. (N12, ST, *B, Ti*)

398-N. Structure and Crystallization Mechanism of Eutectic Alloys. P. S. Vadilo. Paper from "Growth of Crystals", Consultants Bureau, Inc., 1958, p. 109-116.

Zinc-cadmium alloy of eutectic composition consists of large crystals of the main component (up to 1 cm. in size) formed by dendrite growth. The dendrite branches contain small regularly orientated crystals of the second component. The "grain-columns" in a eutectic are dendritic branches of the major component containing normally needle-like inclusions of the second component. 8 ref.
(N12b, N12q; Zn, Cd)

399-N. Study of Processes of Crystallization From Melts. I. N. Fridlyander. Paper from "Growth of Crystals", Consultants Bureau, Inc., 1958, p. 142-150.

The dendrite branches become finer when cooling rates of Al alloys are increased, the interbranch spaces are reduced, the secondary phase inclusions get finer and are mainly trapped and distributed between the dendrite branches. The strengths of cast alloys increase in step with these structural changes and on heat treatment reach the levels found in forged alloys. Maximum improvement in the properties of the cast metals is effected by continuously pouring a thin layer of liquid metal onto a water-cooled moving grid. 18 ref.
(N12, Q-general; Al-b)

400-N. Formation Mechanism of Graphite Spherules in Cast Iron. I. E. Bolotov, V. I. Syreishchikova and S. G. Guterman. Paper from "Growth of Crystals", Consultants Bureau, Inc., 1958, p. 163-167.

A necessary condition for graphite to crystallize as spherulites is that the iron be considerably supercooled. Platelet graphite in normal industrial cast irons is due to impurities (sulphur, oxygen), which prevent the iron from being much supercooled since they reduce the graphite-melt interfacial tension and produce (Fe, Mn)S nuclei for the graphite to crystallize on. Modifiers act by purifying the melt from dissolved sulphur and oxygen and destroying (Fe, Mn)S inclusions, so that the supercooling required for spheroidal graphite formation is produced. 15 ref.
(N12, N8q, E25n; CI-r)

401-N. Apparatus and Methods for Growing Single Crystals of Semiconductors. D. A. Petrov and V. S. Zemskov. Paper from "Growth of Crystals", Consultants Bureau, Inc., 1958, p. 207-214.

Germanium, like many other semiconductors, expands considerably on solidifying and is extremely stress-sensitive. Stresses cause twinning and other undesirable structural defects. Stresses inevitably occur on cooling in a crucible, as in Bridgman's method. Chokhralsky's method of growing from the melt is outlined together with a description of the setup. 10 ref.
(N3r, 1-53; Ge, 14-61)

402-N. A Device for Making and Purifying High-Melting Single Crystals by Zone Fusion. V. P. Butuzov and V. V. Dobrovensky. Paper from "Growth of Crystals", Consultants Bureau, Inc., 1958, p. 252-255.

The apparatus was assembled and pumped down to a limiting pressure of 6.10^{-4} mm. Hg. Temperatures up to 2000° C. in the working area could be produced with the graphite heaters. Single crystals of Ni were obtained up to 30 mm. long and diameter about 10 mm. on single-pass zone fusion. 7 ref.
(N3r, 2-53; 14-61)

403-N. The Influences of Superheating and Inoculation on the Graphitization and the Microstructure of a White Cast Iron. Masao Ibaraki and Taira Okamoto. *Institute of Scientific and Industrial Research, Osaka University, Memoirs*, v. 15, 1958, p. 153-157.
(N8s; CI-p)

404-N. On the Carbide Phases in Iron-Carbon-Silicon Alloys. Toshikuni Okumura. *Institute of Scientific and Industrial Research, Osaka Univer-*

sity, Memoirs, v. 15, 1958, p. 159-166.

Study of the formation of silicocarbide during solidification. 6 ref. (N8r, N12; Fe, *Si, C*)

405-N. A User Looks at Cleanliness of Vacuum-Melted Alloys. Donald E. Nulk. *Metal Progress,* v. 74, Aug. 1958, p. 103-109.

The problem of "how clean is clean" is becoming more acute with the development of new superalloys containing increased amounts of reactive elements. Carbides and nonmetallic inclusions interfere with fabrication, influence service conditions and decrease the effectiveness of the alloy from the standpoint of chemical balance. Three methods may be used to measure cleanliness: modified A.S.T.M. inclusion rating, frequency/severity rating and metallographic classification. (N12, N3, M27, C25; SGA-h, 9-69)

406-N. Some Factors Concerning the Growth of Single Crystals. S. O'Hara. *Royal College of Science and Technology, Metallurgical Club, Journal,* no. 10, 1957-1958, p. 28-30.

Apparatus and procedure for growing Al single crystals from an edge in a graphite mold. Orientations of crystals grown by method were random. 9 ref. (N3r; Al, 14-61)

407-N.* (French.) **Study of the 'Clear Zones' Phenomena in the Structural Hardening of Ni-Cr and Ni-Cr-Mo Alloys.** C. Buckle and J. Poulignier. *Revue de Metallurgie,* v. 55, May 1958, p. 417-429.

The phenomenon of festoons of 'clear zones' known in light alloys as the 'light phenomenon' can be obtained in industrial Ni-Cr and Ni-Cr-Mo alloys by varying rate of cooling after solution heat treatment. If cooling is sufficiently rapid, the phenomenon appears during aging treatment. Its evolution as a function of temperature and time can be followed by micro-examination. Observation on specimens that have undergone creep helps show the manner in which zones participate in plastic deformation of the whole. 6 ref. (N7, 3-68; Cr, Ni, Mo)

408-N.* (French.) **Radiocrystallographic Investigation of Tempered Martensite Carbides Prepared by Quenching Pure Iron-Carbon Steels.** F. Marion and R. Faivre. *Revue de Metallurgie,* v. 55, May 1958, p. 459-469.

Tempered martensite carbides (isolated by electrolytic method) may be considered as a continuous series of nonstoichiometric compounds which approach cementite when the temperature rises or when the duration of isothermal heating is prolonged. Structure is derived from that of cementite by subtraction of carbon atoms. This is represented by a formula. 24 ref. (N8p, 2-64; CN)

409-N. (Russian.) **The Ordering Process in Iron-Cobalt Alloys.** G. N. Kaduikova and Ya. P. Selisskii. *Fizika Metallov i Metallovedeniia,* no. 3, 1956, p. 486-496.

Specimens of alloys containing 25.24-49.51% Co and 74.46-48.5% Fe were cold rolled to 82% reduction and annealed at 180-800° for periods from 1 min. to 2 hr. Degree of ordering was determined by measuring electrical resistance and hardness at room temperature. The presence of alloying elements did not play any important part in increasing hardness. The hardening phenomenon is explained by the ordering process which takes place in the distorted lattice of the cold worked metal and which gives rise to additional stresses. It is suggested that a prerequisite of hardening must be a combination of the initial stages of ordering and of recovery when the relief of residual stresses is taking place slowly. (N10; Fe, Co)

410-N. (Russian.) **Diffusion of Indium, Antimony and Tellurium in Indium Antimonide.** B. I. Boltaks and G. S. Kulikov. *Zhurnal Tekhnicheskoi Fiziki,* no. 1, 1957, p. 82-84.

Diffusion coefficients (D) of In, Sb and Te were measured in coarse-grained InSb ingots using the radioactive In^{114}, Sb^{124} and Te^{127} isotopes by the successive layer removal technique. At one and the same temperature, D falls in the order In, Te and Sb. Extrapolation of the data to high temperatures indicates that near the melting point of InSb, all the D coincide. Differences in the activation energies for diffusion of In, Te and Sb in InSb are related to the mechanism of the effect of these elements on the electrical properties of semiconductors (of the hole type). The introduction of Te influences the electronic nature of the conductivity. (N1e, In, Sb, Te)

411-N. Effect of Low-Frequency Vibrations in the Mold on Ingot Crystallization. V. I. Leontyev. Paper from Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 28-31. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Fine granulation of the ingot structure may take place both as a result of the mixing of the molten mass and the effect of considerable variable strains, acting on the growing crystal from the direction of the mold. In the first case dependence on the velocity of oscillations is manifested, in the second, dependence on acceleration. A nonporous ingot may be obtained if the velocity of the oscillations does not exceed that at which ejection of molten mass drop occurs. To obtain optimal results the ingot (artificially or naturally) should break away from the mold and receive impact at its bottom. 4 ref. (N12; 5-59)

412-N. Form Dependence of Crystal Growth on Speed of Growth. V. I. Malkin. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958. p. 60-65. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Investigation of the crystallization of Pb ingots under conditions of one-sided thermal withdrawal resulted in immediate changes in the speed of growth; comparison with the structure obtained showed that Pb has a speed of growth above which a columnar structure appears in the development of crystals. With speeds of growth less than 0.1 mm. per min. columnar crystals are not formed. 5 ref. (N12, 3-67; Pb)

413-N. Microstructural Investigation of Martensitic Transformation. O. P. Maksimova and A. I. Nikonorova. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 69-100. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Purpose of investigation was to study the features of the structural forms of martensite produced under varying conditions: upon cooling; in the process of plastic deformation; as a result of cooling of previously deformed austenite. New data on phase hardening occurring in austenite in the course of direct and reversed martensitic transformation. 8 ref. (N8p, 3-68)

414-N. Effect of Deformation on the Speed of the Isothermal Martensitic Transformation in Iron-Nickel-Manganese Alloy. O. P. Maksimova, A. I. Nimonorova and G. K. Pogorelov. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 101-113. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Influence of preliminary plastic deformation on kinetics of the isothermal martensitic transformation in an iron alloy containing 22.7% Ni and 3.1% Mn and giving a considerable transformation effect upon deep cooling. The martensitic point, detected upon continuous cooling at a rate of 10° C. per min. is −10°. 14 ref. (N8p, 3-68; Fe, Ni, Mn)

415-N. Phenomenon of Stabilization in Reverse Martensitic Transformation. Ya. M. Golovchiner and Yu. D. Tyapkin. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 141-147. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Metals investigated were two Fe-Ni alloys, 27% Ni and 27% Ni, 1.5% Ti, which experience the reverse martensitic transformation alpha→gamma when heated to suitable temperatures. Phase composition of the specimen after heat treatment was determined by X-ray diffraction. The magnetometric method was used to study the general course of the gamma→alpha transformation and determine the martensitic point. 8 ref. (N8p; Fe, Ni)

416-N. On the Processes of Carbide Formation in Isothermal Decomposition of Alloyed Austenite. R. I. Entin. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 156-164. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

In the pearlite temperature range even the early stages of austenite decomposition result in formation of special carbides and cementite, with a content of alloying elements that is considerably greater than their average content in the steel. The diffusion redistribution of the alloying elements is a necessary component part of the austenite decomposition. The reduced diffusion speed of these elements compared with the diffusion speed of carbon determines in many cases the slowdown of the austenite decomposition processes. 19 ref. (N8, N1e, 2-60; ST)

417-N. Investigation of the Distribution of Chromium and Tungsten During the Decomposition of Austenite Using the Radioactive Tracer Method. S. V. Tsivinsky, L. I. Kogan and R. I. Entin. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 185-199. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Decomposition of alloyed austenite in the pearlite range of temperatures is caused by the need of diffusion redistribution of the alloying carbide-forming elements (Cr or W) in the austenite. During isothermal decomposition of austenite the relative content of the alloying carbide-forming elements in the carbide phase varies relatively little. The influence of secondary diffusion redistribution of the alloying elements among the decomposition products appears only after the termination of the austenite decomposition. (N8, M23q)

418-N. On the Nature of the Hardness of Tempered Steel. G. V. Kurdyumov. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission*, AEC-tr-2924, 1958, p. 221-231. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

The high resistance of hardened steel to plastic deformation is determined by the formation of a special micro and submicrostructure, and by the high elastic limits of the martensite crystals in the hardened steel. The basic role of carbon in resistance to deformation lies in the change of the properties of the crystals of the alpha phase, owing to the penetration of the carbon atoms into the alpha-iron lattice. 28 ref. (N8a; ST, 3-68)

419-N. Effect of Austenite Decomposition Upon Rate of Diffusion of Hydrogen in Steel. R. A. Ryabov and P. V. Gel'd. *Fizika Metallov i Metallovedenie*, v. 4, no. 1, 1957, p. 189-190. (Henry Brutcher, Altadena, Calif., Translation no. 4257.)

Anomalies in graphs of hydrogen diffusion rates against temperature in temperature ranges in which decomposition of austenite accelerates. Measurements of diffusion rates of hydrogen through membranes. Factors governing rate of removal of hydrogen from Ni-Cr steels and their significance in connection with hydrogen embrittlement.
(N1, N8, D11h, Q26s; AY, *Cr, Ni*)

420-N. (Russian.) **Structure of Alloys of Iron With Vanadium and Chromium.** M. I. Zakharova. *Doklady Akademii Nauk SSSR*, v. 119, no. 3, 1958, p. 498-500.

X-ray and metallographic studies of structure of Fe-V and Fe-Cr alloys after heating to various temperatures between 600 and 1400° C., followed by quenching into water. Evidence of formation of beta phase (in addition to alpha and sigma phases) having a face-centered cubic structure. (N6p, Fe, *Cr, V*)

421-N. Changes in the Fine Structure of Austenite and of the Kinetics of the Martensitic Transformation Under the Influence of Plastic Deformation. O. P. Maksimova, A. I. Nikonorova and E. I. Estrin. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission*, AEC-tr-2924, 1958, p. 114-122. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Plastic deformation of Fe alloy with 22.4% Ni, 3.4% Mn leads to sharp increase in stability of the austenite with respect to the martensitic transformation upon cooling. Relatively small deformations, not enough to cause formation of martensite crystals during the reduction process, are already capable in practice of fully preventing the transformation of austenite upon subsequent deep cooling. The increased austenite stability caused by deformation is accompanied by a change in the fine structure of the austenite. 11 ref.
(N8p, 3-68; Fe, *Ni, Mn*)

422-N. Effect of Cooling Conditions on the Kinetics of the Martensite Transformation. O. P. Maksimova and E. G. Ponyatovsky. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission*, AEC-tr-2924, 1958, p. 123-133. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Investigation using thermomagnetic method on Fe-Ni-Mn alloy (22.4% Ni; 3.4% Mn; 0.04% C), having a martensitic point of −30. Presupercooling of the austenite contributes to a more intense course of the martensitic transformation, increasing the initial speed of the isothermal transformation of austenite over the entire martensitic range of temperatures. Increase in speed of martensitic transformation becomes more pronounced with increasing degree and speed of pre-supercooling. 15 ref. (N8p; Fe, *Ni, Mn*)

423-N. On the Effect of Hot Plastic Deformation on the Kinetics of the Martensitic Transformation in High-Nickel Steels. O. P. Maksimova, A. I. Nikonorova and G. K. Pogorelov. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission*, AEC-tr-2924, 1958, p. 134-137. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

High plastic deformation has a substantial effect ending at relatively low temperature (on the order of 700-800°) on the stability of austenite with respect to subsequent deep cooling (on the position of the martensitic point and on the intensity of transformation) in steels containing from 22 to 24% Ni.
(N8p; AY, *Ni*, 3-68)

424-N. Determination of Binding Energy in Austenite Lattices. Yu. V. Kornev. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission*, AEC-tr-2924, 1958, p. 312-316. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Since there is a definite relationship between the self-diffusion activation energy and the binding energy in the lattice, the conclusion was drawn that introducing the carbon into the iron reduces the binding energy in the austenite lattice. Data confirm the deduction that the self-diffusion activation energy can serve as a measure of the binding forces in crystalline lattices of pure metals, and permit extending this deduction to interstitial solid solutions. 8 ref. (N8f, N1d; Fe, C)

425-N. Influence of Carbon on the Binding Forces and on the Static Distortions in Martensite Crystals. G. V. Kurdyumov, V. K. Kritskaya and N. M. Nodia. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission*, AEC-tr-2924, 1958, p. 317-321. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Elastic limit of the martensite lattice is several times greater than the elastic limit of the alpha iron lattice. The cause is apparently the large static distortion of the martensite lattice caused by the presence of carbon atoms dissolved in the lattice. 8 ref.
(N8p, N10a, Q21e; ST, *C*)

426-N.* (German.) **Transformation Phenomena Occurring in Patenting Rope Wires After Electric Resistance Heating in Relation to the Mechanical Properties.** Adolf Rose, Leo Rademacher and Karl Schemmer. *Stahl und Eisen*, v. 78, July 10, 1958, p. 966-974.

Austenitization of prepatented and predrawn rope wire containing 0.4 to 0.8% C creates adequate austenite structures when temperature is from 100 to 150° above ferrite dissolution point. Coarser structures may require higher temperatures. Raising temperature, once austenitization is accomplished, has no influence on mechanical properties. Dilatometric examination of isothermal austenite disintegration indicates that presence of carbon accelerates austenite decomposition before. during and after lead-bath. Isothermal experiments do not alter mechanical properties. Changes in direct, indirect resistance heating or operating conditions during patenting have no significant influence on ultimate stress values of wires. 5 ref.
(N8f, J25, 2-64; ST, 4-61)

427-N. (Russian.) **Fine Crystalline Structure of Some Nickel Alloys.** V. G. Chernyy. *Ukrains'kii Fizichnii Zhurnal*, no. 2, 1957, p. 73-75.

Distortions of crystalline lattice and the dimensions of block mosaic (regions of coherent diffusion) in alloys of the Nichrome type (about 20% Cr and 80% Ni, with up to 1.24% Ti and 2% Al) were determined. Alloys were plastically deformed (up to 80%) and subsequently annealed at 400 to 800°. Alloying with Al and Ti increases hardness after plastic deformation and promotes high-temperature strength. The result is explained by a strengthening of interatomic bonds in the crystalline lattice by introduction of Al and Ti into the solution.
(N1e, N10a, Q24, 2-60; Ni, Cr, Ti, Al)

428-N. The Concentration of Hydrogen in Nickel Under Hydrogen Ion Bombardment. J. Morrison and J. J. Lander. *Electrochemical Society, Journal*, v. 105, Mar. 1958, p. 145-148.

Observation showed no increase in dissolved hydrogen when clean Ni was bombarded. Considerable increases were obtained at 200° C. when Ni was coated with nickel or barium oxide. Energetic ions penetrate the outer surfaces of the coated materials and are trapped in the interior by surface barriers. This shows that normal values of concentration cannot be applied to Ni if its surfaces are contaminated. 4 ref. (N15e; Ni, *H*)

429-N. On the Nature of the Change of the Coercive Force Upon Annealing of Hardened Low-Carbon Steel. I. A. Bildzyukevich, Ya. M. Golovchine and G. V. Kurdyumov. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission*, AEC-tr-2924, 1958, p. 138-140. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

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Factors playing a substantial role in the strong increase in coercive force are the martensitic transformation proper, which causes the formation of characteristic, inhomogeneous micro and submicrostructures and stresses; properties of the martensite crystals themselves, namely the fact that the martensite is a supersaturated solid solution of carbon in alpha iron; a certain heterogeneity of the hardened steel owing to the presence of a certain amount of residual austenite and a partial decomposition of the martensite. 14 ref. (N8p, 2-64; CN-g)

430-N. On the Diffusion of Cobalt, Chromium and Tungsten in Iron and Steel. P. L. Gruzin. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 329-336. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Investigation of the temperature dependence of the diffusion coefficients of Co, Cr and W in the alpha and gamma phases of iron and in carbon steel of eutectic composition. Diffusion coefficients in austenite for all the elements studied differ only slightly. In ferrite at 800-900°, Cr diffuses most slowly and Co most rapidly. W occupies an intermediate position closer to Cr. The diffusion coefficients in steel are almost the same in magnitude for the whole range of temperatures studied. 12 ref.
(N1c; Fe, Cn-b, *Co, Cr, W*)

431-N. On the Problem of Studying Diffusion by the Method of Radioactive Isotopes. P. L. Gruzin and D. F. Litvin. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 337-342. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Isotopes of a great number of elements emit simultaneously both beta and gamma rays. If one deposits such an isotope upon the specimen and subjects the latter to a diffusion anneal, then the relation of the measured intensity of the beta radiation of the specimen to that of the gamma radiation will be decreased. Since the ratio of the intensities of the beta and gamma rays are changed conclusions can be drawn about the diffusion in the specimen and a diffusion coefficient determined.
(N1a, 1-59, 14-62)

432-N. Influence of Inter-Grain Structure of Austenite on the Self-Diffusion of Iron. P. L. Gruzin, E. V. Kuznetsov and G. V. Kurdyumov. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 343-345. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

The role of changes of intra-grain structure in affecting the speed of diffusion can be shown in alloys in which the transition of austenite into martensite occurs only at temperatures lower than room temperature. Materials used for study were two Fe-Ni-C alloys. one containing 19.8% Ni and 0.45% C, the other 24.6% Ni and 0.69% C. 8 ref.
(N1d, N8p; Fe, Ni, C)

433-N. Influence of Carbon on the Self-Diffusion of Iron in the System Iron-Nickel. P. L. Gruzin and E. V. Kuznetsov. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 346-349. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Magnitude of the diffusion coefficients was determined in the temperature range 800-1300° for alloys with 20% Ni and in the range 1000-1330° for alloys with 25% Ni. Carbon weakens the binding forces of the atom not only in gamma iron, but also in the solid solution of a binary Fe-Ni alloy. Influence of carbon on the parameters of self-diffusion in binary alloys decreases with increase of the Ni content. 4 ref. (N1d; Fe, Ni, *C*)

434-N. Influence of Manganese on the Self-Diffusion of Iron. P. L. Gruzin, B. M. Noskov and V. I. Shirokov. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 350-354. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Investigation of the temperature dependence of the self-diffusion coefficient of Fe in the gamma phase of Fe-Mn alloys, by the method of radioactive indicators, using the artificially radioactive isotope Fe^{59}. Both for volume self-diffusion and for self-diffusion between crystallites an increase of the concentration of Mn in the alloy up to 4% leads to an increase in the activation energy and the factor before the exponential. 6 ref. (N1d, Fe, *Mn*)

435-N. Influence of Alloying on the Self-Diffusion of Cobalt. P. L. Gruzin and B. M. Noskov. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 355-360. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Alloying Co with up to 7% Cr leads to an increase of the activation energy of self-diffusion, and increases the interatomic binding in the crystal lattice of the alloy. Alloying with up to 4% Ni increases the activation energy of self-diffusion. Thus, even small concentrations of a second or third component can bring about appreciable changes in the binding forces in alloy lattices. 22 ref.
(N1d, M25h, 2-60; Co, *Cr, Ni*)

436-N. Influence of Chromium on the Self-Diffusion of Iron. P. L. Gruzin. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 362-364. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Chromium appreciably strengthens the interatomic binding forces in the lattice of gamma Fe and reduces the mobility of the Fe atoms in the range of temperatures below 1100°. It is supposed that carbon weakens the interatomic forces in austenite not only in ordinary steel but also in steel alloyed with chromium. 4 ref.
(N1d, M25h, 2-60; Fe, *Cr*)

437-N.* (Czech.) Contribution to the Determination of Stability of Kovar Alloys. Alexander Spirkov. *Hutnicke Listy,* v. 13, 1958, p. 509-512.

Stability determined as function of the square of the characteristic temperature by means of differential thermal analysis. The higher its characteristic temperature, the more stable the Kovar alloy. Kovar alloys containing both alpha and gamma phases show only a mean characteristic temperature; the value of the distortion factor is identical for both phases. Alloys with high characteristic temperature are less susceptible to the gamma-to-alpha transformation than those with lower characteristic temperatures. 5 ref. (N6p, P11; Fe, Ni, Co)

438-N.* (French.) **Study of Cementites With Manganese Substitutions.** Paul Lesage-Bourdon and Andre Michel. *Comptes Rendus,* v. 246, May 5, 1958, p. 2624-2627.

Synthetically prepared samples of ferromanganese containing about 5% Mn were carburized in mixture of CO plus H at 700° C., yielding a Mn-poor alpha phase and a richer gamma phase which become carburized separately and have different Curie points. Homogenization of Mn content is not possible at 700° C., because diffusion is too slow. An anneal at 950° C. provokes decomposition of Mn-poor cementite; stabilized Mn-rich cementite resists this treatment. Specimens stabilized by diffusion of carbon in ferromanganese, heated to 950° C., provided series of homogeneous solid solutions of Mn in cementite. Studies confirmed that Mn largely replaces iron of cementite and exerts powerful stabilizing influence in presence of this carbide. 10 ref.
(N8, 2-64; AD-n, Mn, Fe)

439-N.* (Japanese.) **Ferrite Grain Size and Hardness of Electric Resistance Welded Pipe After Cold Working and Annealing.** Takayoshi Yamamoto. *Sumitomo Metals,* v. 10, Jan. 1958, p. 5-8.

Investigation on mild steel pipe with varying carbon content. Recrystallization occurred at annealing temperature of 600 to 700° C. Tendency for gain growth almost parallel to carbon content. Grain growth greater when cold reduction is about 10%. Both weld and base metal have similar tendency for recrystallization. Grain size is reduced with greater cold working. 16 tables.
(N3, Q29n, 2-64, 3-68; CN, 4-60, 7-51)

440-N.* (Japanese.) **Investigation of NKS-Magnet. Pt. 1.** Toshihiko Tsunowo and Akira Higuchi. *Sumitomo Metals,* v. 10, Jan. 1958, p. 31-36.

Aging, microscopy, differential thermal dilatation, magnetic analysis and X-ray analysis utilized to investigate samples of alloys of 8 Al, 14 Ni, 24 Co, 3 Cu type. Permanent magnetism did not depend upon simple precipitation of alpha prime or gamma phase but upon nucleation and growth of a certain kind of precipitate. High-temperature X-ray analysis indicates that precipitation had irreversible gamma-to-alpha transformation resembling the FeNi binary system. 10 ref.
(N7b; P16q, X11g, SGA-n)

441-N. (Russian.) **Ordering Mechanism in the Alloy Ni_3Mn With Various Additions of Molybdenum.** B. G. Livshits, B. V. Molotilov, N. N. Myuller and N. A. Savost'yanova. *Fizika Metallov i Metallovedenie,* no. 3, 1956, p. 477-482.

Study of alloys containing 74-75% Ni, 21-23% Mn and 0.64-4 10% Mo, quenched after heating to 1000° to bring them into the disordered state and then annealed at 250-550° for prolonged periods. Electrical re-

(*) Articles Available Through Photocopy Service; See Coupon, p. 75.

sistance investigated; thermomagnetic properties determined by the Akulov anisometer; X-ray analyses. Measurements of normal modulus of elasticity by the resonance method. Data from thermomagnetic measurements show that ordering of the alloy takes place in a heterogeneous manner. The introduction of Mo raises the electrical resistance, and lowers the magnetic saturation; however, these effects are more complicated than merely a concentration disordering.
(N10b, 2-60; Ni, Mn, Mo)

442-N.* (German.) **Kinematics of the Growth of Tin Crystals.** Elias Anastasiadis. *Freiberger Forschungshefte,* no. B-21, 1958, p. 11-91.

Experiments with aqueous solutions of $SnCl_2 \cdot 2H_2O$, with and without additions of HCl. Growth of Sn crystals as they develop in an electrolytic solution was recorded by micro-motion-picture equipment and the influence of different concentrations studied. These crystals formed from solution differ very little from crystals grown in a vapor phase, other solutions or in a melt. (N12e; Sn)

443-N.* (Russian.) **Investigation of Effect of Molybdenum, Chromium and Columbium on Properties of Invar Alloys.** A. Z. Ivanuskina and B. G. Livshits. *Fizika Metallov i Metallovedenie,* v. 5, no. 5, 1957, p. 527-535.

Using a dilatometer and electroresistivity tests it was shown that introduction of Mo into permalloy consisting of Ni_3Fe has a negative effect on the ordering of the alloy; however, by increasing Mo above 1%, changes take place in the opposite direction. Thus, there is an increase in electrical resistivity of alloys Ni_3Fe + 2-6% Mo after prolonged low-temperature annealing. 7 ref.
(N10b, P15g, 2-60; Fe, Ni, Cb, Cr, Co)

444-N.* (Russian.) **Kinetics of Isothermal Conversion of Austenitic Carbon Steel on Induction Heating.** I. N. Kidin and Yu. A. Bashnin. *Metallovedenie i Obrabotka Metallov,* July 1958, p. 10-15.

Austenitic steel shows less stability after induction heating than after heating by usual methods, due to the nonuniformity of carbon and the reduction in size of austenite grains. The decisive factor determining the character of austenitic steel during induction heating is the austenitization procedure—the speed of heating in the region of phase transformations. 9 ref.
(N8g, M27c, J22, J2g, 2-64; CN)

445-N* **Floating Crucible Technique for Growing Uniformly Doped Crystals.** W. F. Leverton. *Journal of Applied Physics,* v. 29, Aug. 1958, p. 1241-1244.

This method, a simple modification of the Czochralski technique, permits the growing of large Ge single crystals of uniform resistivity. (N3r, P15g; Ge, 14-61)

446-N. **Variation of the Kinetics of Weakening With the Composition of the Strengthening Phase During Dispersional Hardening.** G. V. Kurdyumov, R. I. Entin and V. M. Rozenberg. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 246-256. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

The weakening of steels and alloys is in many cases related to the coagulation of particles of the strengthening phase. Coagulation of the carbide phase during annealing of quenched steel, or dispersional hardening of alloys, leads to a considerable decrease of strength. One of the methods of increasing the resistance of alloys to weakening at high temperatures consists in delaying the coagulation processes of the strengthening phase by alloying with other elements. Effect of additions of W, Co, and Cb. 4 ref. (N7, Q27c, 2-63, 2-64; ST, Cb, Co, W, AD-n)

447-N. **Effect of Sudden Deformation on the Formation of Martensite Lamellae.** A. Mašin and D. Tlusta. *Ceskoslovensky Casopis pro Fysiku,* no. 2, 1956, p. 225-226. (Henry Brutcher, Altadena, Calif., Translation no. 4275.)

Test pieces of Fe containing 5% Mn and 1% C., oil quenched from 1100° C., with a 1.5-mm. notch, were impact tested on a Charpy machine. The fracture surface and surrounding areas were examined under the microscope. Fine martensite lamellae formed near the fracture surface and were distributed in three ways within the austenite grain; linearly, with martensite needles crossing each other at an angle of 60°; in a mutually perpendicular arrangement; and with martensite precipitated between the differently oriented parts of the mosaic grain. (N8p, 3-68; AY)

448-N. (Latvian.) **Effect of Chemical Composition on Some Details of Martensitic Transformations.** E. L. Vinogradskaya and G. A. Kreslina. *Izvestiya Akademii Nauk Latviiskoi S.S.R.,* no. 2, 1957, p. 153-160.

Alloys of composition C 0.06%, Mn 13.12, Cu 0.28, Co 2.12, remainder Fe, and C 0.12%, Mn 12.93, Cu 1.61, remainder Fe, were studied by the magnetometric method. Specimens were heat treated by soaking at 900° C. and quenching at the rate of 5° C. per min. to −194° C. A complete hysteresis loop was obtained for the reversible martensitic gamma-to-alpha transformation. Increase of C and Cu lowers the Ms point and reduces the amount of alpha-phase obtained when martensitic transformation is complete. Degree of hysteresis of the reversible martensitic transformation is mainly determined by Ms temperature. (N8p; AY, *Mn*)

449-N. (Russian.) **Process of Carbide Formation During the Tempering of Carbon Steel.** B. A. Apaev. *Metallovedenie i Obrabotka Metallov,* no. 1, 1957, p. 2-15.

Study by thermomagnetic method, using "intensity of magnetization versus temperature" curves, of the transformation characteristics during tempering of steels 40, U8 and U12. Phase constitutions of steels of different C contents differ sharply from each other after tempering under identical conditions. The reason for this is the presence of an intermediate χFe_vC in medium and high-carbon steels which is absent in low-carbon steels. 55 ref. (N8a; CN)

450-N. (Russian.) **Self-Diffusion of Iron Within Grains and Along Grain Boundaries.** S. Z. Bokshtein, S. T. Kishkin and L. M. Moroz. *Metallovedenie i Obrabotka Metallov,* no. 2, 1957, p. 2-10.

Coefficients of self-diffusion determined by the autoradiographic method, using the Fe^{59} isotope. The investigation was carried out on alpha-Fe at 800° and on gamma-Fe at 1000, 1100 and 1200°.
(N1d; Fe)

451-N. (Russian.) **Effect of Heating Rate on Completeness of Recrystallization of Previously Quenched Steel.** B. G. Sazonov and A. S. Zlatkina. *Trudnovoi Institut Fizicheskoi Metallurgii Ural Filial Akademii Nauk SSSR,* no. 17, 1956, p. 20-40.

Effect of heating rate up to 1000° C. per sec. The degree of orientational relationship between the newly forming austenite and the original structure, on heating a quenched steel, determines the degree of development of secondary grain texture and consequently the completeness of recrystallization when the steel is heated. The magnitude of the effect depends essentially on the heating rate.
(N5, M27c, 2-61; ST)

452-N. (Russian.) **Effect of Prior Overheating of Steel on the Decomposition Kinetics of Supercooled Austenite.** V. D. Sadovskii. *Trudnovoi Institut Fizicheskoi Metallurgii Ural Filial Akademii Nauk SSSR,* no. 17, 1956, p. 41-66.

Decomposition kinetics in steel 37KhNZA, 40KhSA and 30KhGSA, after factory annealing (as supplied), quenching from the normal temperature and quenching from 1300° C. followed by high-temperature tempering. Prior quenching from high temperatures leads to the nucleation of pearlite-troostite colonies (after subsequent heating to temperatures in the interval between Ac_3 and the c point of Chernov) in the boundaries of the original grains of the overheated metal. This leads to retardation of the transformation process, increasing with increasing original grain size.
(N8, 2-64; AY)

453-N. (Russian.) **Effect of Small Concentrations of Alloying Elements on the Self-Diffusion of Iron.** V. V. Sanadza and T. A. Tsivtsigadze. *Trudy Gruzinskogo Politekhnicheskogo Instituta,* no. 1, 1956, p. 141-144.

Effect of small additions of vanadium studied by radioisotope Fe^{59} electrolytically deposited on the specimens. Diffusion annealing was carried out in vacuo at 1050, 1100 and 1150°, and the coefficient of diffusion was determined by removing layers and subsequently measuring the total activity. Activation energies of diffusion of Fe for alloys containing 0.1, 0.25 and 0.4% V were 62, 54 and 40 kcal. per g-atom, respectively. Alloying Fe with even small amounts of V leads to a reduction in the activation energy of diffusion and consequently weakens the binding forces in the crystal lattice of the alloy.
(N1d, 2-60, M25h; Fe, *V*)

454-N. (Russian.) **Diffusion of Indium, Antimony and Tellurium in Indium Antimonide.** B. I. Boltaks and G. S. Kulikov. *Zhurnal Tekhnicheskoi Fiziki,* no. 1, 1957, p. 82-84.

The diffusion coefficients of In, Sb and Te in coarse-grained InSb ingots were measured using the radioactive In^{114}, Sb^{124} and Te^{127} isotopes by the successive layer removal technique. At one and the same temperature, diffusion falls in the order In, Te and Sb. Extrapolation of the data obtained to high temperatures indicates that near the melting point of InSb, all the coefficients coincide. Differ-

ences in the activation energies for diffusion of In, Te and Sb in InSb are related to the mechanism of the effect of these elements on the electrical properties of semiconductors (of the hole type). The introduction of Te influences the electronic nature of the conductivity.
(N1e, P15g; In, Sb, Te)

455-N. (Ukrainian.) **Transformation in Heat Resisting Alloy No. 1 of the Fe-Cr-Al System.** P. P. Kuz'menko. *Naukovi Zapiski Kievskogo Instituta,* no. 5, 1956, p. 135-139.

When an alloy containing Fe 75.34%, Cr 18.35, Al 5.8, C 0.04, Mn 0.18 and Si 0.29, is annealed for long periods at 1200° C. in sealed capsules, its properties alter considerably. After annealing 228 hr. the lattice dimension is reduced from 2.8808 to 2.8660A, density increased by 5%, microhardness increased by about 3.5 times and brittleness sharply increased. During annealing a new phase is precipitated in the form of hard inclusions. After 228 hr. alpha-to-gamma transformation occurs. It is concluded that as normally made the alloy is not in equilibrium, that equilibrium is reached very slowly and that it is accompanied by decomposition of the single-phase solid solution. (N8; SGA-h)

456-N. Microscopic Study of Transformations in Metal-Powder Compacts Being Heated. Ya. G. Davidovich and K. V. Kononova. *Zavodskaya Laboratoriya,* v. 24, no. 1, 1958, p. 62-63. (Henry Brutcher, Altadena, Calif., Translation no. 4295.)

Previously abstracted from original. See item 202-N, 1958.
(N6; 2-62, 6-70)

457-N. (Hungarian.) **TTT-Curves of Standard Steels.** Istvan Mester. *Kohaszati Lapok,* v. 91, Apr. 1958, p. 168-173.

8 ref. (N8; ST)

458-N. (Russian.) **New Types of Solid Solutions in High-Titanium Slags.** A. V. Rudneva, M. S. Model and T. Ya. Malysheva. *Academy of Sciences of the USSR, Proceedings,* v. 115-117, 1957, p. 27-31.

New series of solid solutions of unlimited miscibility have been discovered and studied: (1) $2MgO \cdot TiO_2 - 2FeO \cdot TiO_2$ and (2) (Fe, Mg, Mn) $O \cdot TiO_2 - Ti_2O_3$. In addition to the known solid solutions having the Ti_3O_5 (anosovite) structure, the two newly discovered solid solutions also play a very important part in the phase composition of high-titanium slags. 7 ref.
(N12p; Ti, RM-q)

459-N. (Russian.) **On Dissolving Graphite in Austenite.** K. P. Bunin and A. A. Baranov. *Metallovedenie i Obrabotka Metallov,* July 1958, p. 15-18.

Investigation discloses that filling the vacancies formed in austenite during dissolution of graphite has a self-diffusing character. 15 ref.
(N1d; ST)

460-N. Growth of Preferentially Oriented Aluminum Single Crystals. Theodore H. Orem. *National Bureau of Standards, Journal of Research,* v. 60, June 1958, p. 547-549.

Method permits growth of crystals having both preferred orientation and any desired cross section.
(N3r, M26c; Al, 14-61)

461-N. (Russian.) **Study of the Formation of Crystals of Martensitic Phases by the Microcinematographic Method.** A. L. Belinkii. *Doklady Akademii Nauk SSSR,* no. 4, 1956, p. 556-558.

Formation and rate of growth of martensitic beta-phase crystals in Cu-Sn bronzes containing 24.6-24.8% Sn and of martensite crystals in steel 50N20G2 and also of the effect of prior plastic deformation in the linear growth rate of martensite crystals. Increase in the degree of prior plastic deformation reduces the rate of growth of crystals and makes them adopt a zig-zag, interrupted form. When the temperature is reduced, the growth rate of beta-phase crystals is lowered, which demonstrates the thermal nature of the martensitic transformation.
(N6q, N8p, 3-68; Cu-n; ST)

462-N. (Russian.) **Investigation of the Mechanism of Aging of High-Coercivity Iron-Nickel-Aluminum Alloy.** B. G. Livshits and V. S. L'vov. *Fizika Metallov i Metallovedeniye,* no. 3, 1955, p. 455-458.

Alloy of 27% Ni, 15% Al, remainder Fe, investigated. Coercivity and temperature coefficient of electric resistivity measured at various stages of heat treatment. Supercooled solid solution of Fe, Ni and Al alloy breaks up at 800-850° C. into an Fe phase and a Ni-Al phase. At a lower temperature (700° C.) there is a further decomposition of the Ni-Al phase.
(N7a, P16; Fe, Ni, Al)

463-N. (Russian.) **Study of Phase Composition and Phase Homogeneity Limits of Vanadium-Carbon-Oxygen System. Pt. I. Vanadium-Carbon System.** M. A. Gurevich and B. F. Ormont. *Zhurnal Neorganicheskoi Khimii,* no. 2, 1957, p. 356-366.

At high temperatures, the alloys are ternary solid solutions of ferrite subject to transformation under annealing or slow cooling; the temperature of the transformation rises continually from 868° C. for FeCr to 1225° C. for FeV.
(N6p, M24c; V, C, O)

464-N. (Russian.) **Transitions in Solid State in Copper-Zinc System in Range of Apha Solid Solution.** A. T. Grigor'yev, Yu. M. Sokolovskaya and V. N. Pyatritskiy. *Zhurnal Neorganicheskoi Khimii,* no. 7, 1957, p. 1547-1551.

Phase transitions are accompanied by formation of the chemical compound CuZn which has a low-temperature modification $alpha_1$ (transition at 233° C.) and a high-temperature modification $alpha_2$ (transition at 452° C).
(N6p; Cu, Zn)

465-N. Recovery of Embrittled Cadmium Plated Steel. H. H. Johnson, E. J. Schneider and A. R. Troiano. Case Institute of Technology. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131654, Dec. 1957, 22 p. $.75.

The baking process used to mitigate hydrogen embrittlement during Cd electroplating of steel is not always effective. Influence of Cd electroplate upon the recovery characteristics of hydrogen embrittled steel indicates that the Cd plate strongly deters hydrogen outgassing upon baking and thus delays recovery. This recovery rate decreases as the plate thickness increases.
(N4, Q26s; ST, *Cd,* 8-12)

466-N. (Russian.) **Intercrystalline and Volume Diffusion of Manganese Into Iron.** D. S. Kazarnovskiy. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk,* no. 7, 1956, p. 94-102.

A study was made of the frontal diffusion at 1100-1200° C. of Mn into Fe. The diffusion of Mn into ordinary Fe proceeds along a straight front, parallel to the surface of the sample; in high-purity Fe the diffusion takes place predominantly along the grain boundaries. (N1; Fe, *Mn*)

467-N. (Russian.) **Solubility of Zinc in Metallic Compounds Cu_2Mg and Cu_2Cd.** Ye. I. Gladyshevskiy and P. I. Kripyakevich. *Izvestiya Sektora Fizika Khimicheskogo,* v. 27, 1956, p. 209-211.

Solubility of Zn in Cu_2Mg is from 2 to 6 at. %. Solubility in Cu_2Cd is considerably lower, about 3%. Difference is explained by the greater electron capacity of Cu_2Mg. The computed magnitudes of the limiting electron concentration for Cu_2Mg and Cu_2Cd agree well with data for the solubility of Zn in these compounds.
(M24c; Zn, Cu, Mg, Cd)

468-N. (Russian.) **On the Transformations of the Silicide MnSi.** K. N. Davydov and P. V. Gel'd. *Fizika Metallov i Metallovedeniye,* v. 2, no. 1, 1956, p. 192.

At approximately 600° C. there is a sharp change in the character of the expansion curves of the alloys; a jump is seen in the temperature dependence of the heat content and a rapid decrease in electrical conductivity. This leads to the conclusion that phase transformations may occur in the silicide Mn_3Si at approximately 600° C.
(N6p; Mn, Si)

469-N. (Russian.) **Role of the Surface in the Graphitization of White Cast Iron.** K. P. Bunin, I. V. Grechnyi and N. M. Danil'Chenko. *Liteinoe Proizvodstvo,* no. 5, 1955, p. 12-15.

Formation of graphitic inclusions proceeds irregularly over a cross section; they form readily in the surface zones and less so in the center. Where the section is small, graphitization takes place throughout, but is limited in thick parts. The phenomenon is explained by the molecular picture of the process when the formation of graphite is related to the migration of vacancies from the exterior surfaces mainly as a result of the laws of diffusion and dislocations; thicker test pieces require more for complete graphitization. (N8s; CI-p)

470-N.* (Russian.) **Effect of Cooling Rate on Graphitization of White Iron.** O. M. Galemina. *Liteinoe Proizvodstvo,* June 1958, p. 17-19.

Increasing the cooling rate gives rise to formation of disoriented dendrites in center of chill mold, reduces rate of development of eutectoid crystals and leads to formation of shrinkage holes, greater friability and other defects. 9 ref.
(N8s; CI-p, 9-67)

471-N. (Russian.) **Some Problems of the Theory of Graphitization of Malleable Cast Iron.** A. A. Egorov. *Nauchneye Trudy Moskovskoe Poligraficheskogo Instituta,* v. 3, 1955, p. 113-134.

(*) **Articles Available Through Photocopy Service; See Coupon, p. 75.**

Graphitization centers occur during the annealing of white iron only through the indirect decomposition of Fe_3C. Factors are temperature of graphitization — the higher the temperature, the more centers of graphitization are formed; shape and size of Fe_3C crystals—the finer the Fe_3 crystals, the faster the indirect decomposition, other conditions being equal. (N8s; CI-s)

472-N. (Russian.) **Properties of Tin and Tin-Lead Solders at Low Temperatures.** A. S. Medvedev. *Tsvetnye Metally,* no. 2, 1954, p. 52-60.

Effect of additions on the rate of transformation of white to gray tin; up to 0.5% Sb and about 0.3% Bi prevent the transformation. There is also in white Sn a reversible brittle transformation at −30° C. This greatly lowers the impact value of tin solders at low temperatures.
(N6p, Q6n, 2-63; Sn, *Pb,* SGA-f)

473-N. (Russian.) **Estimation of the Percentage Transformation of Retained Austenite in Spring Strip.** G. E. Egorov, G. T. Nazarenko and V. P. Moiseev. *Zavodskaya Laboratoriya,* v. 23, no. 1, 1957, p. 52-55.

Structural transformations during heat treatment of 70S2kHA strip are followed by measuring the magnetic saturation and coercive force. The saturation was measured by calculation of the contraction between the poles of an electromagnet, and coercive force by the induction method of dropping a measuring coil into an open magnetic circuit in a hollow solenoid. After 1½ hr. tempering at 400° C. there was practically no retained austenite. Martensite decomposes rapidly in the same temperature range. In continuous furnaces in which strip remains for tempering only 35 sec., only 25% of the retained austenite decomposed at 400° C. (N8, 1-54, M23a; ST, SGA-b)

474-N. (Russian.) **Diffusion of Hydrogen Through Iron and Binary Iron-Chromium and Iron-Nickel Alloys at High Pressures and Temperatures.** A. A. Shicherbakova. *Zhurnal Prikladnoi Khimii,* v. 29, no. 6, 1956, p. 879-884.

Speed of diffusion of hydrogen through Fe-Cr alloys at 100 atm. pressure and temperature from 200 to 600° C. diminishes considerably when the Cr content is increased to 19%. The speed through Fe-Ni alloys increases with addition of Ni from 1.29 to 10%, but further increase of Ni from 10 to 20% causes a considerable reduction in speed.
(N1e, 2-61, 3-74; Fe, *Ni, Cr, H*)

475-N. Crystals Can Be Stronger. *Chemical and Engineering News,* v. 36, Sept. 8, 1958, p. 51-52.

Experiments in growing perfect single crystals at General Electric. (N3r)

476-N. Electrolytic Transfer of Carbon in Liquid Iron-Carbon Alloys. M. A. Rabkin. *Journal of Applied Chemistry of the USSR,* v. 30, 1957, p. 832-835. (Translation by Consultants Bureau, Inc.)

It was shown by a study of the action of an electric field on liquid iron-carbon alloys that the carbon in these alloys exists in the form of positively charged ions. 10 ref. (N1e; Fe, C)

477-N. On the Theory and Computations for the Introduction of Elastic Oscillations Into Molten Metals. I. I. Teumin. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 13-27. (Available from U. S. Office of Technical Services, Washington 25, D. C.; also available as Henry Brutcher, Altadena, Calif., Translation no. 3930.)

Previously abstracted from original. See item 296-N, 1957.
(N12, 1-74; 14-60)

478-N. On the Mechanism of the Influence of Aluminum on the Secondary Austenite Grain in Steel. D. S. Kamentskaya and I. B. Piletskaya. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 52-59. (Available from U. S. Office of Technical Services, Washington 25, D. C.; also available as Henry Brutcher, Altadena, Calif., Translation no. 4033.)

Previously abstracted from original. See item 365-N, 1957.
(N2, N3, P13a; ST, Al)

479-N. On the Change of Coercive Force in Low-Temperature Tempering. N. S. Fastov. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 148-150. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Considered as a result of redistribution of carbon concentration and consequently as a result of redistribution of stresses. 7 ref. (N8a, J29)

480-N. A Study of the Self-Diffusion of Alpha Iron. V. M. Golikov and V. T. Borisov. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 365-376. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Temperature dependence of coefficient of self-diffusion of alpha iron determined in the range 650 to 850° by radioactive istopes. 8 ref. (N1d, 1-59; Fe)

481-N. Theory of Methods for Determining Concentration Dependencies of Diffusion Coefficients in Solid Solutions. B. Ya. Lyubov and B. I. Maksimov. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 377-400. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Method using radioactive indicators. 6 ref. (N1a, 1-59)

482-N. Laws of Crystal Growth During Electrolysis. K. M. Gorbunova. Paper from "Growth of Crystals", Consultants Bureau, 1958, p. 39-45.

Microscopic observations on crystal growth at the cathode at very low currents show that at the instant of formation the crystal form is limitingly simple and correct; silver crystals take tetrahedral or octahedral forms, more rarely cube ones. The faces grow by expansion of layers which most frequently start at the edges. 10 ref. (N12d)

483-N. Growth Mechanism and Structure of Metal Deposits Produced by Electrocrystallization. K. M. Gorbunova, O. S. Popova, A. A. Sutyagina and Yu. M. Polukarov. Paper from "Growth of Crystals", Consultants Bureau, 1958, p. 46-52.

Certain regularities in the growth of cathodic metal deposits in electrolytic cells, either as dense coatings or friable dendritic structures have been observed. Both types are widely used in technology. By varying deposition conditions, deposits with the most varied technically useful properties (high hardness and wear resistance, defined electrical and magnetic properties) can be obtained. 16 ref.
(N12d, Q-general)

484-N. A Study of the Diffusion of Carbon in Nickel and Its Alloys by Means of the Radioactive Isotope C^{14}. P. L. Gruzin, Iu. A. Polikarpov and G. B. Fedorov. *Physics of Metals and Metallography,* v. 4, no. 1, p. 74-80. (Translation by Pergamon Institute.)

Previously abstracted from original. See item 385-N, 1957.
(N1, 1-59; Ni, *C*)

485-N. Stress Relaxation in Aluminum Magnesium Alloys. M. G. Gaidykov and V. A. Pavlov. *Physics of Metals and Metallography,* v. 4, no. 1, 1957, p. 99-105. (Translation by Pergamon Institute.)

Previously abstracted from original. See item 386-N, 1957.
(N4; Al, Mg)

486-N. Concerning the Mechanism of the Formation of Spheoidal Graphite in Cast Iron. I. E. Bolotov, V. I. Syreishchikova and S. G. Guterman. *Physics of Metals and Metallography,* v. 4, no. 1, 1957, p. 144-146. (Translation by Pergamon Institute.)

Previously abstracted from original. See item 387-N, 1957.
(N8s; CI-r)

487-N.* (German.) **Theory and Practical Application of Relief Diffusion.** Hansfriedrich Hadamovsky. *Bergakademie,* v. 9, Dec. 1957, p. 621-624.

The undersirable formation of coarse grains by recrystallization resulting after exceeding a minimum deformation or a certain annealing temperature can be controled by metallic additions. For Al, traces of Mg, Zn, Si, Cu, Mn, Fe promote the critical deformation limit or the temperature limit. This ability increases from Mg to Fe in the sequence shown. An Fe addition of 0.043 at. % (0.09% by weight) delays recrystallization and also reduces the grain notably. 24 ref.
(N1c, N4, 2-60; Al)

488-N.* (German.) **Investigations on Banded Structure in Plain Carbon and Alloy Structural Steels.** **Erwin** Plockinger and Alfred Randak. *Stahl und Eisen,* v. 78, July 24, 1958, p. 1041-1058.

The secondary structure after hot working is determined by the primary structure of the ingot. In the gamma-alpha transformation of plain carbon steels, as a result of the separation of carbon the ferrite is found within the interdendritic regions while the pearlite enters the dendritic branches. With alloyed steels, the dendritic branches contain the ferrite (i.e., the separation of carbon takes place in reverse direction). Additions of Si, Mn, P, Cr, Mo, Ni and their influence on the secondary structure.
(N12b, 2-60; CN, AY)

489-N. (Russian.) **Concerning the Mechanism of Surface Saturation of Iron and Steel by Boron.** G. V. Samsonov and N. Y. Tseytina. *Fizika Metallov i Metallovedenie,* v. 1, no. 2, 1955, p. 303-306.

In pure iron there is a diffusion reaction of boron with formation of iron boride FeB, causing relatively high micro hardness of the saturated layer (on the order of 730 to 790 kg. per sq. mm.). In the presence of carbon the reaction consists mostly of diffusion on the boundaries of the grain of the solid solution of complicated carboborides, causing the high hardness of the saturated layer (on the order of 1400 to 2100 kg. per sq. mm.). (N1e, Q29n; ST, *B*)

490-N. (Russian.) **Carbide Formation in Tempering of Chromium-Nickel Steels and Chromium-Nickel-Tungsten Steels.** S. Z. Bokshteyn, S. T. Kishkin, A. F. Platonova and N. M. Popova. *Fizika Metallov i Metallovedenie,* v. 1, no. 3, 1955, p. 459-466.

Investigation of carbide formation in Cr-Ni steel (0.4 C, 1.96 Cr and 2.75% Ni) and in Cr-Ni-W steel (0.38 C, 1.71 Cr, 2.09 Ni and 1.51% W) after hardening from 960° and tempering, as a function of temperature (200 to 650°) and of time of soaking. (N8r, 2-64; AY, *Cr, Ni, W*)

491-N. (Russian.) **Diffusion of Nitrogen in Steels Alloyed With Chromium and Manganese.** A. G. Lesnik, P. I. Nekrashevich and V. Sirik. *Naukovi Zapyski Kyivskoho Institutu,* v. 14, no. 8, 1955, p. 125-126.

Evaporation in vacuum was used to investigate diffusion of nitrogen in Fe-Cr alloys (4.71% Cr) and Fe-Mn (2.21% Mn). Activation energy of diffusion of N in alloys and in pure iron was determined. (N1e; AY, *Cr, Mn, N*)

492-N. (Russian.) **Neutralizing the Adverse Effects of Chromium in Malleable Cast Iron by Modifying With Ferrotitanium and Aluminum.** V. K. Obolonnyi, V. N. Pliutovich and I. A. Stepanov. *Trudy Studencheskogo Nauchno-Tekhnicheskogo Obshchestva Moskovskogo Tekhnicheskogo Uchilishcha Imeni Baumana,* v. 3, 1957, p. 67-75.

The cast irons under study contained 0.04, 0.13 and 0.19% Cr. The adverse effect of Cr in quantities up to 0.18% can be neutralized by ferrotitanium or Al. To prevent the appearance of cracks in sections 20-25 mm. thick it was decided to add to the ladle 0.01% Te or Bi, which do not affect the graphitization of malleable cast iron during annealing. (N8s, 2-60; CI-q, *Cr, Ti, Al*)

493-N. (Russian.) **Relationship Between Conditions of Solidifications and the Texture and Mechanical Properties of Cast Iron.** G. V. Chertkov. *Trudy Vsesoyusnogo Zaochnogo Instituta Lesotekhniki,* no. 2, 1956, p. 105-121.

Making use of known thermophysical constants calculations were made of the temperature distribution in iron castings having a cross-section 92 by 92 mm. at various times after the beginning of solidification. The temperature gradient is significant and determines the various sizes of graphite grain on the periphery and at the center of castings. (N12, E25n; CI)

494-N. **The Martensite Phase Change in Metals.** M. A. Jaswon. *Research Applied in Industry,* v. 9, Aug. 1958, p. 315-323.

Crystallographic aspects, relating the austenite-martensite transformation to feasible slip processes in the two lattices. 22 ref. (N8p)

495-N. (Russian.) **Alpha ⇄ Beta Transformation of Zirconium, Observed With the Field Emission Electron Microscope.** A. P. Komar and V. N. Shrednik. *Fizika Metallov i Metallovedenie,* v. 5, no. 3, 1957, p. 452-464.

23 ref. (N6, M21e)

496-N. (Book.) **Growth of Crystals. First Conference on Crystal Growth, 1956.** 294 p. 1958. Consultants Bureau, Inc., 227 W. 17th St., New York 11, N. Y. $15.

Papers presented at the Institute of Crystallography, Academy of Sciences of the U.S.S.R. Relevant papers are abstracted separately. (N12)

497-N. (Book.) **Problems of Metallography and the Physics of Metals. Fourth Symposium.** B. Ya. Lyubov, ed. 476 p. 1958. *U. S. Atomic Energy Commission,* AEC-tr-2924.

Papers on structure of liquid metals, crystallization processes and physical means of influencing their kinetics, phase transformations in steel, strengthening and weakening of steel and alloys, determination of diffusion parameters in alloys by means of radioactive isotopes and physical chemistry of metallurgical processes. Papers are abstracted separately. (N-general, M-general, Q-general)

Physical Properties

440-P. **Investigation of Alloys of Magnesium and Their Properties. Pt. 2. Thermal and Electrical Properties of Magnesium-Base Alloys.** H. Baker. Dow Chemical Co. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131436, Sept. 1957, 28 p. $.75.

Electrical resistivities to 500° F. were determined for the cast Mg alloys AZ31A and B, AZ36A, AZ81A, AZ91C, AZ92A, AM100A, EK30A EK41A, EZ33a HK31A, rolled HK31A and HM21XA, extruded HM31XA, cast HZ32A, EM31, EM31 (Zr grain refined), EK31 (with rare earth in the ratio 2 Di/1 MM), and EK31 (with rare earth as Di only). Thermal conductivities of cast AZ31A and B, AZ63A, AZ81A, AZ91C, AZ92A, AM100A, EK30A, EK41A, EZ33A, HK31A, rolled HK31A and HM21XA, and cast HZ32A were calculated from the electrical data. Values of enthalpy, specific heat, and heat of fusion measured for AZ31B, HK31A, HM21XA, HM31XA, and ZK60A. (P15g, P11h, P12r; Mg-b)

441-P.* **Note on the Specific Heat of Plutonium Metal.** D. J. Dean, A. E. Kay and R. G. Loasby. *Institute of Metals, Journal,* v. 86, June 1958, p. 464.

Values for the specific heat of Pu over the range from −40 to 550° C. and for the latent heats of transformation at the various phase transitions. (P12r, P12q; Pu)

442-P.* **An Evaluation of Interface Energies in Metallic Systems.** J. W. Taylor. *Institute of Metals, Journal,* v. 86, June 1958, p. 456-463.

Method for calculating solid-solid and solid-liquid interface energies based on estimates of grain boundary energies of a number of pure metals and solid solutions. Grain-boundary energies are derived from the corresponding liquid surface energies, coupled with the assumption that the surface energy of a solid metal or alloy may be estimated from that of the corresponding liquid by applying a correction of one-third of the latter for the increase of surface energy on freezing and that the grain boundary energy of a metal or alloy is taken as being one-third of the corresponding solid surface energy. 24 ref. (P13h)

443-P.* **Nitrogen in Steel.** Digest of six papers presented at the Electric Steel Conference, A.I.M.E., Pittsburgh, December 1957. *Metal Progress,* v. 74, July 1958, p. 136, 138, 140, 142.

Calculations showing the maximum solubility in nitrogen of typical N_2-Mn-Cr steels. Heats of the corresponding analyses were then made and chemical analysis closely checked the predictions. (P12e, D5; SS, Mn, Cr)

444-P.* **Optical Properties of Semiconductors Under Hydrostatic Pressure. Pt. 3. Germanium-Silicon Alloys.** William Paul and D. M. Warschauer. *Physics and Chemistry of Solids, Journal,* v. 6, July 1958, p. 6-15.

The optical absorption edge of a number of Ge-Si alloys was measured at room temperature as a function of hydrostatic pressure from 1 to 7000 kg. per sq. cm. The pressure variation of the energy corresponding to the edge $(dE/dP)_T$ varies continuously with composition from pure Ge to pure Si. A break in this curve is found between 10 and 20% Si, consistent with an interpretation in which the (100) conduction-band minimum becomes lower than the (111) minimum as Si content is increased. 11 ref. (P17a, 3-74; Ge, Si)

445-P.* **Constitution and Magnetic Properties of Iron-Rich Iron-Aluminum Alloys.** A. Taylor and R. M. Jones. *Physics and Chemistry of Solids, Journal,* v. 6, July 1958, p. 16-37.

Constitution of high-purity Fe-Al alloys over the composition range 0-62 at.% Al investigated, primarily by X-ray diffraction methods. New lattice-parameter data were obtained. Diffraction patterns taken at elevated temperatures show that the phase diagram needs correction in the region of Fe_3Al, along with the further addition of a sloping transformation boundary beyond 18% Al. Alloys in the composition range 18-33% Al undergo a classical phase change and, on heating, pass successively from the Fe_3Al type of atomic ordering to the FeAl type. 49 ref. (P16, M24b, N6; Fe, Al)

446-P.* **Magnetic Structure of Fe_3Al.** R. Nathans, M. T. Pigott and C. G. Shull. *Physics and Chemistry of Solids, Journal,* v. 6, July 1958, p. 38-42.

A polarized-neutron-beam spectrometer was used to determine the room-temperature magnetic structure of ordered Fe_3Al. Results show that the Al atoms possess no magnetic moment and that the Fe moments differ for the two sublattice sites. Data taken on higher-order magnetic reflections also permitted a comparison of the magnetic form factors for each of the different sites with that of metallic iron. 7 ref. (P16; Fe, Al)

447-P.* **Resistivity and Hall Coefficient of Antimony-Doped Germani-**

(*) **Articles Available Through Photocopy Service; See Coupon, p. 75.**

um at Low Temperatures. H. Fritzsche. *Physics and Chemistry of Solids, Journal,* v. 6, July 1958, p. 69-80.

The Hall coefficient R and resistivity p of Ge single crystals containing between 5 × 10^{14} and 10^{18} antimony atoms per cc. were reinvestigated at temperatures between 1·3 and 300° K. Two different processes of impurity conduction could be distinguished by adding compensating p-type impurities to n-type Ge and investigating the resulting change of p at low temperatures. 32 ref. (P15, 2-63; Ge, *Sb*)

448-P.* Electrical Resistivity and Thermal Conductivity of Plutonium Metal. Thomas A. Sandenaw and Robert B. Gibney. *Physics and Chemistry of Solids, Journal,* v. 6, July 1958, p. 81-88.

The electrical resistivity of two specimens of high-purity Pu is reported for the temperature range from 26° K. to approximately 780° K. These resistivity measurements give further evidence for the six allotropic modifications of solid Pu found by thermal analysis and dilatometric measurements. Temperature coefficients of resistivity for the various phases are included, as well as indicated phase-transformation temperatures and the heat of transition for the alpha→beta change. 7 ref. (P15g, P11h, N6p; Pu)

449-P.* Electrical Resistivity of Thin Films of Potassium at 100° K. D. G. Worden and G. C. Danielson. *Physics and Chemistry of Solids, Journal,* v. 6, July 1958, p. 89-95.

Measured as a function of thickness in the range 148-1600 Å. The experimental results are in excellent agreement with Fuch's theoretical predictions in the range 500-1600 Å and show that the scattering of the electrons at the film surfaces is completely diffuse. Comparison of experimental and theoretical curves gives a bulk resistivity parameter of 1.85 μΩ-cm., a mean free path of 1180 Å, and an electron to atomic density ratio of 1·0. 15 ref. (P15g, 2-63; K, 14-62)

450-P. Measurement of the Thermal Properties of Various Aircraft Structural Materials. P. C. Covington and S. Oglesby, Jr. Southern Research Institute. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131432, Aug. 1957, 71 p. $2.

Thermal properties of a group of metal and plastic structural materials which included honeycomb cores, a foamed-core sandwich panel, a laminated panel and sandwich panels with various honeycomb cores and facing materials. (P12, T24a; 7-59)

451-P. Measurement of Convective Heat and Mass Transfer. A New Approach. R. A. Granville and A. Sigalla. *Iron and Steel,* v. 31, July 1958, p. 355-356.

Simple method of measuring local skin coefficient; relevance to heat and mass transfer phenomena; proposes application of technique to heat and mass transfer problems of iron and steel industry. (P11k, P11j)

452-P. The Water Wettability of Metal Surfaces. Donald J. Trevoy and Hollister Johnson, Jr. *Journal of Physical Chemistry,* v. 62, July 1958, p. 833-837.

Preparatory techniques and contact angles with water reported for seven metals and alloys: Al, brass, Cu, Mg, Ni, SS, and Zn. (P13h; Al, Cu-n, Cu, Mg, Ni, SS, Zn)

453-P. Anomalous Transmission of X-Rays by Single Crystal Germanium. L. P. Hunter. *Physical Sciences, Proceedings,* v. 61, 1958, p. 214-219.

6 ref. (P17c; Ge, 14-61)

454-P. A Semi-Empirical Equation for the Initial Susceptibility of Homogeneous Ferromagnetic Alloys. E. W. Lee and R. C. Jackson. *Physical Society, Proceedings,* v. 72, July 1, 1958, p. 130-134.

6 ref. (P16; SGA-n)

455-P. On the Effect of Magnetic Field Cooling on Permeability of 45-25 Perminvar and 65 Permalloy. Makoto Sugihara. *Science Reports of the Tohoku University,* v. 41, Jan. 1958, p. 221-225.

Initial permeability increased when a magnetic field was applied in the vicinity of 480° during cooling. 4 ref. (P16; Ni-b, SGA-n)

456-P. The Effect of Sulphur on the Solubility of Oxygen in Liquid Iron. Z. Buzhek and A. Samarin. *Academy of Sciences of the USSR, Proceedings,* v. 114, 1957, p. 437-438. (Translation by Consultants Bureau, Inc.)

5 ref. (P12e; Fe, *O, S*)

457-P. (Russian.) **Residual Magnetization of Nickel and Its Stability.** I. E. Startseva and Ya. S. Shur. *Fizika Metallov i Metallovedenie,* no. 3, 1956, p. 568.

Influence of the preliminary treatment (recrystallizing anneal, oxidizing anneal, and plastic deformation by tension or compression) on the value of I_r of Ni and its stability against alternating magnetic fields, mechanical vibrations and temperature fluctuations. (P16; Ni)

458-P. (Russian.) **Density and Surface Tension of Liquid Commercial Titanium.** V. P. Yelyutin and M. Maupakh. *Izvestiya Akademii Nauk S.S.S.R., Otdelenie Tekhnicheskikh Nauk,* no. 4, 1956, p. 129-131.

Method and results for Ti alloy with 0.1% Fe, less than 0.2% Si, less than 0.1% Ca, and less than 0.5% Mg. At the crystallization temperature the surface tension was equal to 1510 ±18 dyne per cm. (P13h; Ti)

459-P. (Russian.) **Temperature Dependence of Magnetic Susceptibility of Electrons in a Metal.** G. E. Zil'berman and F. I. Itskovich. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki,* no. 1, 1957, p. 158-160.

Calculated at limitingly weak magnetic fields over a wide temperature range for hexagonal crystals and Bi. The calculation was carried out for a quadratic dependence of the electron energy on the wave vector. Formulas for susceptibility were obtained for the cases where only small groups of conductivity electrons exist in K-space; in addition to them, there is a larger electron group; and there is also a larger group of holes. It was found that certain metals have a comparatively simple temperature-dependence of magnetic susceptibility. (P16)

460-P. (Russian.) **Preparation and Study of Intermetallic Compounds in Thin Layers.** V. A. Presnov and V. F. Synorov. *Zhurnal Tekhnicheskoi Fiziki,* no. 1, 1957, p. 123-126.

The electrical properties of binary preparations of the systems Al-Sb, In-Sb and Ga-Sb, obtained by mutual evaporation on glass spoons, were studied in relation to the concentration of the components. The electrical properties of thin layers of AlSb, InSb and GaSb differ strongly from the properties of the bulky forms. Electrical conductivity changes little up to room temperature, but at higher temperatures it quickly decreases. In individual specimens an inversion of the sign of the Hall constant is explained by the advance of the natural conductivity at about 100° because of the small size of the forbidden zone. Alpha increases considerably with rise of temperature. (P15; Al, In, Ga, Sb, 14-62)

461-P. (Russian.) **Experimental Investigation of the Transverse Nernst-Ettinghauser Effect in Tellurium.** I. V. Mochan. *Zhurnal Tekhnicheskoi Fiziki,* no. 6, 1955, p. 1003-1012.

Dependence of the Nernst constant on temperature was experimentally plotted and a maximum at 350° K. was confirmed. Presence of a maximum is due to the occurrence of carriers of opposite sign. (P15g; Te)

462-P. (Russian.) **Electric Conductivity of Germanium-Silicon Alloys in Liquid State.** M. S. Ablova, O. D. Yelpat'yevskaya and A. R. Regel'. *Zhurnal Tekhnicheskoi Fiziki,* no. 6, 1956, p. 1366-1368.

Measured by method of rotating magnetic fields in vacuum at high temperatures. Dependence of the width of the forbidden zone, of the value of the jump in electric conductivity upon melting, and of the maximum electric conductivity in the liquid state on the percentage ratio of the alloy component. (P15g; Ge, Si, 14-60)

463-P. (Russian.) **Heat Conduction of Commercial Materials at Low Temperatures.** N. V. Zavaritskiy and A. G. Zel'dovich. *Zhurnal Tekhnicheskoi Fiziki,* no. 9, 1956, p. 2032-2036.

Thermal conductivity in the range from 2 to 100° K. was measured for copper (annealed and unannealed), Cupalloy (unannealed), Duralimin (unannealed), phosphor bronze (unannealed), "mel'khior" (Cu-Ni alloy)-(annealed and unannealed), manganin (unannealed), stainless steel (unannealed), and graphite. The average heat conduction of these materials was calculated in the ranges from 4.2 to 20.4, 20.4 to 78, and 4.2 to 78°. (P11h; Cu, Cu-b, Cu-s, Ni, SS)

464-P. On the Coercive Force and the Width of the X-Ray Interference Line in Low-Carbon Alloyed Steels. Ya. M. Golovchiner and V. M. Golubkov. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 151-154. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Parallel studies of hardness, coercive force and widths of X-ray interference lines after hardening and tempering. The presence of rather difficulty soluble carbides in the steels studied necessitated hardening from 1320-1330° C. Concluded that in the temperature range under investigation the steel remains homogeneous and there is no decrease in the lattice distortion. 4 ref. (P16, Q29n, 2-64; ST)

465-P. Solubility Limit of Certain Alloying Admixtures in Steel. N. S. Fastov and B. N. Finkelshtein. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 200-204. (Available from U. S. Of-

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

fice of Technical Services, Washington 25, D. C.)

The effect of any alloying admixture on the properties of the steel depends substantially on whether it is in the basic solid solution or in the insoluble carbide. Thus it is of great interest to determine the solubility limit of the alloying admixture in the austenite, and also the amounts and the compositions of the carbide phase as functions of the composition of the steel and of its heat treatment. A steel alloyed with vanadium was considered. Two phases of the steel were formed after isothermal soaking, in equilibrium with each other: austenite, alloyed with vanadium and carbide of vanadium. (P12e, N8, ST)

466-P. Thermodynamic Activity of Carbon in Austenite Containing Manganese and Silicon. V. M. Rozenberg and L. A. Shvartsman. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 211-218. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

An equation is proposed for the activity coefficient of carbon in austenite containing Mn and Si which can be used for approximate calculation of the solubility of carbon in austenite at various concentrations of the above elements for a temperature of 1000° C. Estimates were made of the values of heat of solution of carbon in Mn-containing austenite at various concentrations of Mn. 5 ref.
(P12b, P12q; ST, *C, Mn, Si*)

467-P. Properties of Ternary Alloys of the Diborides of Titanium, Chromium and Zirconium. K. I. Portnoi and G. V. Samsonov. *Doklady Akademii Nauk SSSR,* v. 116, no. 6, 1957, p. 976-978. (Henry Brutcher, Altadena, Calif., Translation no. 4273.)

Variation of microhardness, lattice constant and electrical resistivity of an equimolar mixture of Ti and Cr diborides when Zr diboride is alloyed with it. Solubility of ZrB_2 in the binary boride and of the binary boride of ZrB_2.
(P15g, M26, Q29n; Cr, Ti, Zr, B)

468-P. (Czech.) **Magnetization Curves of Thin Layers of Iron.** Karel Zaveta. *Ceskoslovenska Casopis Fiziki,* no. 3, 1956, p. 303-312.

Magnetization curves of layers measuring from 125 to 7870 Å obtained by evaporation in vacuum. A torsion magnetometer was used. The curves showing the magnetization work and the corresponding residual magnetization versus the thickness display an anomoly in the 1100 Å thickness range. It was shown by weighing that the density of the layer is less than the density of the metal. (P16; Fe, 14-62)

469-P. (Czech.) **Structure of Domains in Polycrystalline Materials. Pt. 2. Domains on Planes Making a Small Angle With (110).** Ladislav Spacek. *Ceskoslovenska Casopis Fiziki,* no. 3, 1956, p. 313-323.

Magnetic structure of polycrystalline iron with particular attention to the (110) surface, which is rotated somewhat relative to the [110] axis and the grinding plane. Domain structure is observed in individual crystals as a function of angle of inclination. Preparation of specimens, effect of mechanical and electrolytic polishing on domain structure, and action of anisotropic etching. Connection between domain structure and crystallographic orientation. (P16c; Fe)

470-P. (Russian.) **Hydrogen Adsorption of Nickel Layers Condensed in Deep Vacuum.** N. N. Kavtaradze. *Doklady Akademii Nauk SSSR,* no. 4, 1957, p. 822-825.

The adsorption of H_2 on Ni layers prepared by sublimation in vacuum was studied at temperatures from 195 to 100° and under pressures from 10^{-6} to 4×10^{2} mm. of Hg. Shown that H_2 adsorption on Ni, Fe, Cr and Pt consists of a reversible and an irreversible part. The reversible part strongly depends on the pressure and the temperature; the irreversible part strongly depends basically on the temperature.
(P13d; Ni)

471-P. (Russian.) **Optical Properties of Polycrystalline Layers of Cadmium Selenide.** Vishchakas Brazdzhunas. *Lietuvos TSR Mokslu Akademija Darbai, Sbornik an Lit S.S.S.R.,* 1956, p. 21-33.

Investigation of the absorption, reflection and refraction of thin polycrystalline layers of cadmium selenide in the spectral region from 0.23 to 1.34 microns. The thickness of the layers varied from 0.1 to 3 microns. The absorption constant was determined with allowance for the reflection. On the edge of the band of intrinsic absorption, at 0.7 micron, there was observed a slight maximum of absorption, whose position corresponds to the position of the maximum of the photosensitivity of the layers. (P17; 14-62, Cd)

472-P. (Russian.) **Electroconductivity and Thermo-EMF of Intermetallic Compound SbZn.** M. V. Kot. *Ucheni Zapiski Khurkovsky Universitet,* no. 24, 1956, p. 11-18.

Electroconductivity and thermo-emf. of alloys of Zn and Sb containing 48 to 65 at. % Zn were measured in the range of 250 to 625° K. The width of the forbidden zone of the compound ZnSb was 0.6 ev. (P15g; Zn, Sb)

473-P. (Russian.) **The Curie Point in Thin Films of Ferromagnetics.** A. S. Mil'ner and N. L. Polyakova. *Ucheni Zapiski Kharkovsky Universitet,* no. 64, 1956, p. 159-165.

Experimental verification of the dependence of the Curie point on the thickness of Ni films. Films are obtained by evaporation in vacuum on glass from a Ni wire or from a crucible made of Al oxide. Curie point was measured from the relative change in the magnetic moment of the film upon increase in temperature. The Curie temperature is independent whether the Ni is coated on cold or hot glass. The irreversibility of the first magnetization curve, its dependence on the speed of heating, and the increase in the magnetic moment at room temperature for Ni films coated on cold glass leads to the conclusion that apparently these films are in an unstable phase. (P16d; Ni, 14-62)

474-P.* On the Electrical Properties of Polycrystalline Boron. Ryosei Uno. *Physical Society of Japan, Journal,* v. 13, July 1958, p. 667-675.

Specimens of boron with various conductivities were studied. Conductivity varies not with impurity content, but with crystal structure. 18 ref. (P15g, 3-71; B)

475-P. (Russian.) **Ratio of Hysteresis to Eddy-Current Losses in Electric Steel.** V. V. Druzhinin and Yu. P. Burdakova. *Electrichestvo,* no. 8, 1956, p. 50-54.

Electromagnetic losses due to hysteresis and eddy-currents as a function of magnetization frequency and amplitude of a.c. induction. Reduction in the total electromagnetic loss, attained in recent years in the better grades of transformer steel, is due to a very sharp reduction in the hysteresis losses.
(P16; ST, SGA-n)

476-P. (Russian.) **Investigation of the Change in the Electric Resistivity of Molybdenum Permalloy Under the Influence of Magnetization and Elastic Deformation.** R. G. Anniyev and G. Myalikgulyyev. *Izvestiya Akademii Nauk Turkmenskoi S.S.S.R.,* no. 2, 1956, p. 45-53.

Experimental investigation of longitudinal galvanomagnetic effect in Mo Permalloy (81.09% Ni, 14.9% Fe, 3.2% Mo and 0.81% other admixtures) in the inversion field. Measurements were carried out at room temperature. Curves show dependence of the longitudinal galvanomagnetic effect versus effective magnetic field and elastic force and versus the square of the intensity for both series of specimens. With simultaneous increase of magnetization and of elastic deformation, the value of the magnetization increases, while its electric resistivity decreases. (P15g, P16, 3-68; Ni-b, *Mo*)

477-P. (Russian.) **Determination of the Optical Constants of Germanium.** K. D. Sinel'nikov, I. N. Shklyarerskiy and B. S. Skorobogatov. *Ucheni Zapiski Kharkovsky Universitet,* no. 6, 1955, p. 135-140.

Index of refraction of thin Ge films was measured by the Ge-wedge method, coated in vacuum on glass or on silver. (P17b; 14-62; Ge)

478-P.* (Spanish.) **Thermogravimetric Study of Intermediate Products of Uranium Metallurgy.** L. Gasco and R. Fernandez. *Real Sociedad Espanola de Fisica y Quimica, Anales,* v. 54 (B), Mar. 1958, p. 181-190.

Thermal decomposition of some intermediate compounds such as uranium peroxide, ammonium uranate, uranium and ammonium pentafluoride, uranium tetrafluoride and uranous oxide studied by means of Chevenard's thermobalance. Some data on pyrolysis of synthetic mixtures of intermediate compounds which may occasionally appear during industrial processes. 20 ref.
(P12, C-general; U)

479-P.* (English.) **Effect of Tension on the Magnetostriction of Iron Single Crystals.** Hideo Takaki and Jun-ichi Hayashi. *Physical Society of Japan, Journal,* v. 13, July 1958, p. 703-709.

Measured at room temperature by means of strain gage technique. 6 ref. (P16, 3-66; Fe, 14-61)

480-P.* (Russian.) **Influence of Annealing Conditions on Thermal Magnetic Aging of Permanent Magnets.** A. M. Morozova and F. I. Feigina. *Fizika Metallov i Metallovedenie,* v. 5, no. 5, 1957, p. 428-433.

Thermal magnetic aging with the aim of increasing magnetic stability. Lengthening of annealing time at 580° C., as well as annealing by

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

stages under special conditions, will increase stability of permanent magnets without changing their coercive force. (P16, X11g, 2-64)

481-P. On Dispersability of Ferromagnetic Separations in Austenitic Alloys, Using Demagnetization Curves. N. I. Eremin. *Metallovedenie i Obrabotka Metallov*, July 1938, p. 27-30. (Henry Brutcher, Altadena, Calif., Translation no. 4279.)

Domain boundaries do not form in ferromagnetic powder particles possessing strong coercive force. Because of removal of domain boundaries, the usual demagnetization mechanism cannot take place. Changes in magnetization can only take place because of the coherent spins rotating in the strong fields. Study of single domain separations in austenitic steels, within which can be found separations of ferrite, opens up a new field in physical metallurgy. (P16; ST, 6-68)

482-P. (Russian.) **The Nernst Thermomagnetic Effect in Iron-Nickel Alloys.** E. P. Svirina and R. P. Ivanova. *Frizika Metallov i Metallovedeniya*, no. 3, 1956, p. 444-468.

The relationship between the Nernst effect (N) and magnetization was studied on seven specimens of Fe-Ni alloys containing 28-85% Ni. Measurements were carried out in a solenoid producing a field of up to 1250 oersteds and magnetization was determined by the ballistic method. The Nernst e.m.f. was linearly dependent on magnetization, but a break was observed in the curves near saturation. Relationship between Nernst e.m.f. and alloy composition; effect on this relationship of heat treatment for the alloy $FeNi_3$ is tentatively explained by the ordering phenomena in this alloy. (P15g, P16; Fe, Ni)

483-P. (Russian.) **The Nernst-Ettingshausen Effect in Strong Magnetic Fields.** I. M. Tsidil'kovskii. *Zhurnal Tekhnicheskoi Fiziki*, no. 1, 1957, p. 12-22.

Measurements were made on seven specimens of HgSe, made by hot pressing or sawed from cooled melts. The longitudinal, transverse and longitudinal-transverse Nernst-Ettingshausen effects were measured in the range 130-480° K. at field strengths up to 10^4 oersted. Relationship between the Nernst-Ettingshausen effect field and the magnetic field at high field strengths is nonlinear, and shows a maximum, at which it is particularly useful to calculate the carrier mobility. (P15g, P16; Hg, Se)

484-P. (Russian.) **The Equilibrium and Nonequilibrium Properties of Polycrystalline Selenium.** P. T. Kozyrev. *Zhurnal Tekhnicheskoi Fiziki*, no. 1, 1957, p. 35-44.

Equilibrium electrical properties of polycrystalline Se, crystallized at atmospheric pressure and also at high pressure, from amorphous Se. Crystallized Se was brought to equilibrium condition by holding at 100-120° C. for 80-100 hr. and then at 40° C. for 100 hr. Observations were made of the reproducibility of the temperature-equilibrium electrical conductivity curve. With increasing temperature the equilibrium electrical conductivity increases to a certain maximum value and then decreases. (P15g, 2-61; Se)

485-P. (Russian.) **Electrical Properties of the Intermetallic Compound CdSb.** I. M. Pilat. *Zhurnal Tekhnicheskoi Fiziki*, no. 1, 1957, p. 119-122.

The Cd and Sb, after multiple vacuum distillation, had impurity contents $\leq 0.0001\%$. CdSb single crystals were made by fusion, followed by special heat treatment and zone melting. Activation energy is given. It was found possible to obtain high amplification factors, using suitable surface treatments, impurity additions and conditions of compound formation. (P15, Cd, Sb, 14-61)

486-P. (Russian.) **Galvano-Magnetic Properties of Tellurium at Low Temperatures.** S S. Shalyt. *Zhurnal Tekhnicheskoi Fiziki*, no. 1, 1957, p. 189-204.

Studies of variation with temperature of the electrical conductivity of Te between 100° C. and 1.3° K., of the Hall constant and the change in resistivity in magnetic fields up to 26,000 oersteds at room temperature and at liquid N_2 and He temperatures. Attempts at theoretical interpretation of the experimental data. (P15g, P16, 2-63; Te)

487-P. (Russian.) **Excitation of Atoms of Semiconductors in Multi-Electronic Models.** S. V. Vonsovskii and A. N. Kushnirenko. *Fizika Metallov i Metallovedenie*, v. 5 no. 5, 1957, p. 395-401.

11 ref. (P15g; EG-j)

488-P. (Russian.) **Magnetic Properties of Magneto-Anisotropic Specimens of Ferromagnetic Powder.** E. V. Shtol'ts, Ya. S. Shur and G. S. Kandavrova. *Fizika Metallov i Metallovedenie*, v. 5, no. 5, 1957, p. 412-420.

7 ref. (P16; 6-68)

489-P. Enthalpy and Heat Capacity From 0° to 900° C. of Three Nickel-Chromium-Iron Alloys of Different Carbon Contents. Thomas B. Douglas and Ann W. Harman. *National Bureau of Standards, Journal of Research*, v. 60, June 1958, p. 563-568.

The enthalpy relative to 0° C. of three alloys measured at nine temperatures from 100 to 900° C. by a precise "drop" method. Results are almost independent of the several variations in prior heat treatment investigated and the heat capacity temperature curves of the three alloys are almost coincident, but there is a marked shift in each curve within the interval 500 to 600° C. 7 ref. (P12r; Ni, Cr, Fe)

490-P. (Russian.) **Investigation of the Temperature Dependence of Heat Conduction, Electric Conductivity, and Specific Heat of Bi and Pb in a System of Bi-Pb Alloys.** V. Ye. Mikryukov and N. A. Tyapunina. *Fizika Metallov i Metallovedeniye*, no. 1, 1956, p. 31-41.

Heat conduction and electric conductivity measured by the Kohlrausch method. Alloys of 22 different concentrations were investigated at temperatures to 242° C. (P11h, P15g, P12r, 2-61; Bi, Pb)

491-P. (Russian.) **Study of Magnetization Processes in Silicon Iron by the Powder Figure Method.** V. R. Abel's. *Fizika Metallov i Metallovedeniye*, no. 3, 1956, p. 562-563.

Magnetization process studied in Si-Fe (4% Si) crystals with various surface crystallographic orientations, in differently oriented magnetizing fields and for various specimen thicknesses (0.005-0.3 mm.). Using the powder figure method the magnetic structure of the crystals and its changes under the influence of the magnetic field were studied. (P16; Fe, *Si*, SGA-n)

492-P. (Russian.) **Investigation of the Change in the Electric Resistivity of Molybdenum Permalloy Under the Influence of Magnetization and Elastic Deformation.** R. G. Anniyev and G. Myalikgulyyev. *Izvestiya Akademii Nauk Turkmenskoi SSR*, no. 2, 1956, p. 45-53.

Investigation of the longitudinal galvano-magnetic effect in Mo permalloy (81.09% Ni, 14.9% Fe, 3.2% Mo and 0.81% other admixtures) in the inversion field. (P15g, P16; Ni, *Mo*, SGA-n)

493-P. (Russian.) **Electroconductivity and Thermo-EMF of Intermetallic Compound SbZn.** M. V. Kot. *Uchenye Zapiski Kishinevsk, Universiteta*, no. 24, 1956, p. 11-18.

Measured for alloys of Zn and Sb containing 48 to 65 at. % Zn in the range 250 to 625° K. Width of the forbidden zone of the compound ZnSb was 0.6 ev. (P15, 2-63; Sb, Zn)

494-P. (Russian.) **Temperature Dependence of Magnetostriction of Ferromagnetic Alloys.** D. I. Volkov, V. I. Chechernikov and V. B. Tseytlin. *Vestnik Moskovskogo Universiteta*, no. 2, 1956, p. 21-28.

Study of alloys with a Ni-base (Ni-Cu, Ni-Co, Ni-Mn and a Ni-Fe alloy with 45% Ni) in the temperature region close to the Curie point. (P16b, 2-61; Ni-b)

495-P.* The Effects of Irradiation on Magnetic Materials. D. I. Gordon, R. S. Sery and R. E. Fischell. *Engineers' Digest*, v. 19, July 1958, p. 303-304, 318. (From *Nucleonics*, v. 16, June 1958, p. 73-77.)

A 3.5% silicon iron, Orthonol, two molybdenum Permalloys, vanadium Permendur, 16 Alfenol and nickel-ferrite studied. 6 ref. (P16; 2-67, Fe, Al, Mo, Ni, Si, SGA-n)

496-P. (Russian.) **Thermo-Electric Properties of the Compound $CrSb_2$.** N. Kh. Abrikosov and V. F. Bankina. *Doklady Akademii Nauk SSSR*, no. 4, 1956, p. 627-628.

Electric conductivity and thermal emf. of Cr-Sb alloys (Sb 80 to 85%) and temperature dependence of these values for the compound $CrSb_2$ (82% Sb). The alloy with 82% Sb has a single-phase structure and had minimum electric resistivity and a maximum thermal emf. $CrSb_2$ is a chemical compound of the semiconductor type with activation energy of 0.16 and 0.32 ev. (P15, 2-61; Cr, Sb)

497-P. (Russian.) **Change in Thermal Emf. of Metals During Plastic Deformation.** N. F. Kunin. *Fizika Metallov i Metallovedeniye*, v. 2, no. 2, 1956, p. 237-243.

The value of the absolute thermal emf. and of the Thomson coefficient are sensitive to a change in the properties of the metal (copper) during plastic deformation. Induced thermal emf. increases with deformation, and its sign and magnitude are independent of the boundary conditions of the deformation. (P15, 2-61, 3-68; Cu)

498-P. (Russian.) **Anomaly of Electric Resistance in the Fe_3Si Alloy.** I. G. Gutovskiy and Ya. P. Selisskiy. *Fizika Metallov i Metallovedeniye,* v. 2, no. 2, 1956, p. 375-376.

Electric resistivity of Fe_3Si at high temperatures; temperature region of disordering. Measurements show a strictly linear course of the resistivity vs. temperature curve up to 600°, where a sharp break in the curve was observed and a subsequent slight reduction in the electric resistivity as the temperature was increased to 1100° C.
(P15g, 2-61; Fe, Si)

499-P. (Russian.) **Measurement of Thermal Emf. of Metals of the Copper Subgroup Under the Influence of Plastic Deformation at Various Temperatures.** N. F. Kunin and I. Z. Melamed. *Fizika Metallov i Metallovedeniye,* v. 2, no. 3, 1956, p. 423-427.

For Cu, Ag and Au under 40-50% deformation at various temperatures, the induced thermal emf. is proportional to the magnitude of the relative deformation. Other conditions being equal, thermal emf. diminishes with increasing temperature.
(P15, 2-61, 3-68; Cu, Ag, Au)

500-P. (Russian.) **Electric Properties of Germanium at Super Low Temperatures.** E. I. Abaulina-Zavaritskaya. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki,* no. 6, 1956, p. 1158-1160.

Dependence of the electric resistivity of single crystals of Ge on temperature and on the intensity of electric field in the range from 0.15 to 20° K.
(P15, 2-63; Ge, 14-61)

501-P. (Russian.) **Electric Properties of the Intermetallic Compounds CdSb.** I. M. Pilat. *Zhurnal Tekhnicheskoi Fiziki,* no. 1, 1957, p. 119-122.

Electric conductivity and thermal emf. from −180 to +250° C., the rectification of CdSb at the point contact and the triode effect.
(P15, 2-61; Cd, Sb)

502-P. (Russian.) **Effect of Ion Bombardment on the Detecting Properties of Semiconductors.** V. E. Kaganer, A. R. Regel' and O. V. Sorokin. *Sbornik statey Leningradskogo Instituta Tochnoy Mekhanika i Optiki,* v. 18, 1955, p. 126-141.

Influence of ion bombardment on the voltage-current characteristics of a point contact Si, Ge, SiC, PbS and SbZn with tungsten. Ion bombardment carried out with ions of hydrogen, air, oxygen, benzine, tellurium and manganese to obtain p-n and p-n-p junctions on the surface of the crystals. (P15; EG-j)

503-P. (Russian.) **Effect of Chemical Composition on Magnetic Properties of Electrotechnical Iron.** N. N. Zaychikov, R. M. Zheltenkova, O. T. Kondratova, A. F. Korostylev, Yu. Ye. Korotkov, B. I. Mashirin, Yu. N. Mynkin and L. S. Panasyuk. *Trudy Moskovskogo Aviats. Instituta,* v. 60, 1956, p. 4-12.

Effect of grain size and chemical composition on the value of magnetizing force of Armco iron using chemical and metallographic data obtained in regular production shop tests. Correlation coefficient between value of magnetizing force and carbon content was found to be 0.301, and correlation between magnetizing force and the sulphur content was 0.372. Magnetizing force increases with increasing content of C or S. The content of Mn, P, Mi and Cu, does not exert a noticeable effect. The magnetizing force increases with diminishing grain size. (P16, 2-60, 2-59; Fe)

504-P. (Russian.) **Pressure Coefficient of Electric Resistivity of Certain Metals at the Temperature of Liquid Helium.** V. I. Khotkevich. *Uchenye Zapiski Khar'kovsk. Universiteta,* v. 64, 1955, p. 151-152.

Ag, Cu, Au, Pt and Pb were placed under pressure of 4000, 6900, 1800, 6900 and 1400 at. respectively. The first four were investigated at the temperature of liquid helium. Lead was investigated at the temperature of liquid hydrogen.
(P15g, 2-63, 3-74; Ag, Au, Cu, Pt, Pb)

505-P. (Russian.) **Technique for Measurement of the Relative Magnetic Viscosity of High-Coercivity Alloys.** B. V. Getling. *Zavodskaya Laboratoriya,* v. 23, no. 1, 1957, p. 42-48.

Apparatus consists of a ballistic galvanometer, a magnetizing device, a magnetic two-pole contactor with pushbutton stations, an electronic time relay of the relaxational type, a magneto-electric oscillograph and a power pack. Magnetic viscosity of specimens was studied by following the time decay of residual inductance. Method was used for studying the magnetic viscosity of Fe-Ni-Al alloys with different Fe contents, and different heat treatments. (P16, X26; Fe, Ni, Al)

506-P. (Russian.) **Electric Properties of InSb.** D. N. Nasledov and A. Yu. Khalilov. *Zhurnal Tekhnicheskoi Fiziki,* v. 26, no. 1, 1956, p. 6-14.

Investigation on monocrystalline and polycrystalline specimens of InSb of stoichiometric composition with excess of In or Sb (approximately 0.1%). Hall effect, change of resistance in the magnetic field and electric conductivity.
(P15; In, Sb)

507-P. (Russian.) **Thermo-Electric Properties of Cd-Sb Alloys.** V. A. Yurkov and N. Ye. Alekseyeva. *Zhurnal Tekhnicheskoi Fiziki,* v. 26, no. 4, 1956, p. 911-912.

A null method was used to measure the thermal emf. of Cd-Sb alloys relative to Cu for concentrations of 0-100% Sb at junction temperatures of 10 to 100° C.
(P15; Cd, Sb)

508-P. (Russian.) **Electrical Properties of Bismuth. Pt. 2. Electrical Properties of Bismuth Selenide. Pt. 3. Electrical Properties of Bismuth Telluride.** P. P. Konorov. *Zhurnal Tekhnicheskoi Fiziki,* v. 26, no. 7, 1956, p. 1394-1405.

Electrical conductivity, Hall constant and coefficient of thermo-electric emf. of polycrystalline and single crystal samples of Bi_2Se_3 investigated over the range 20-700° K. and occasionally at liquid air temperatures. Same measurements on Bi_2Te_3. (P15, 2-63; Bi, *Se, Te*)

509-P. **Measurement of Surface Tension at the Boundary Between Superconducting and Normal Phases.** Iu. V. Sharvin. *Soviet Physics JETP,* v. 6, June 1958, p. 1031-1032. (Translation by American Institute of Physics.)

Surface tension between superconducting and normal phases determined by measuring the period of a simple laminar structure, obtained in a flat sample located in an inclined magnetic field.
(P15g, P13h; Sn)

510-P. **Determination of Vapor Tension of Solid Cobalt in Iron Using Radioactive Isotopes.** Yu. V. Kornev and V. N. Golubkin. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 299-311. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Data were obtained on the vapor tension of cobalt in the temperature range from 1050 to 1250; the heat of sublimation at the same temperatures; the ratio of the self-diffusion activating energy to the binding energy. 19 ref.
(P12c, P13, N1d; Co, Fe, 1-59)

511-P.* **Pre-Irradiation Tests on U-Si Alloys.** L. M. Howe and L. G. Bell. *Atomic Energy of Canada Ltd., CR-MET-763,* May 1958, 42 p.

Hardness, density, electrical resistivity and corrosion resistance as well as metallographic and X-ray examinations on U-Si core material. 7 ref.
(P-general, Q-general, 2-67; U, Si)

512-P.* **Low-Temperature Resistivity of the Transition Elements: Ruthenium and Osmium.** G. K. White and S. B. Woods. *Canadian Journal of Physics,* v. 36, July 1958, p. 875-883.

Experimental values for electrical resistivity of ruthenium and osmium from 2 to 300° K. and for thermal resistivity from 2 to 140° K. 19 ref. (P15g, 2-63; Ru, Os)

513-P.* **Susceptibility of Lead-Telluride PbTe.** Milos Matyas. *Czechoslovak Journal of Physics,* v. 8, 1958, p. 301-308.

Experiments and calculations demonstrating effect of temperatures from 90 to 600° K., various lattice defects, on susceptibility. 11 ref. (P16, 2-63; EG-j, Pb, Te)

514-P.* **Susceptibility of Selenides and Tellurides of Heavy Elements.** Milos Matyas. *Czechoslovak Journal of Physics,* v. 8, 1958, p. 309-314.

Temperature dependence of the susceptibility of PbSe, Sb_2Se_3, Sb_2Te_3, Bi_2Se_3 and Bi_2Te_3. The connection between the molar susceptibility of the characteristic crystal lattice of these semiconductors and the total number of electrons in their molecules is pointed out. 6 ref.
(P16, M24b, 2-63; EG-j, Sb, Se, Te)

515-P. **Temperature Variation of Spontaneous Magnetization in Alloys Near the Curie Point.** K. Belov and Ia. Paches. *Physics of Metals and Metallography,* v. 4, no. 1, 1957, p. 35-39. (Translation by Pergamon Institute.)

Previously abstracted from original. See item 296-P, 1957.
(P16d; Ni)

516-P. **Magnetic Properties of the Ordered Fe_3Al Alloy.** V. I. Ivanovskii. *Physics of Metals and Metallography,* v. 4, no. 1, 1957, p. 53-57. (Translation by Pergamon Institute.)

Previously abstracted from original. See item 397-P, 1957.
(P16, N10; Fe, Al)

517-P. (Russian.) **Heat Transfer and Thermal-Physical Properties of Molten Alkali Metals.** I. I. Novikov, A. N. Solov'ev, Ye. M. Khabakhpasheva, V. A. Gruzdev, A. I. Pridantsev and M. Ya. Vasenina. *Atomnaia Energiya,* no. 4, 1956, p. 92-106.

(*) **Articles Available Through Photocopy Service; See Coupon, p. 75.**

Heat transfer to liquid sodium in case of turbulent flow in a Cu or Ni tube. Procedures for measurement of viscosity, temperature conduction and density of the molten metals.
(P11, P10a, P10f; Cu, Ni, 14-60)

518-P. (Russian.) **Effect of Elastic Stresses and Thermal-Mechanical Working on Magnetic Properties of Certain Rigid Magnetic Materials.** M. G. Luzhinskaya and Ya. S. Shur. *Fizika Metallov i Metallovedenie,* v. 4, no. 2, 1957, p. 239-244.

Influence of elastic tension and torsion and also thermal-mechanical working on magnetic properties of alloys of following composition: 8% V, 50% Co, remainder Fe; 14% V, 52% Co, remainder Fe; and 15% Mn, remainder Fe.
(P16, Q21; Fe, Co, *V, Mn*)

519-P. (Russian.) **Method for Investigating the Electro-Deposition and Galvanic Corrosion of Cadmium.** O. K. Kudra and A. V. Gorodysskiy. *Izvestiia Kievskii Politekhnicheskii Instituta,* v. 17, 1956, p. 179-190.

To determine the relationship between the quality of electroplating and the current density used in its deposition, the preservation of the potential of Cd deposited on Pt, Ag, Cu and Fe is investigated as a function of current density.
(P15, L17, R11m; Cd)

520-P. (Russian.) **Electrochemical Investigation of Silver-Tellurium Alloys.** M. A. Klochko and Z. S. Medvedeva. *Izvestiia Sektora Fizika-Khimicheskogo Analiza Institut Obshchei i Neorganicheskoi Khimii imeni Akademii Nauk,* v. 27, 1956, p. 133-140.

Investigation of eight Ag-Te alloys, from pure Ag to 37.2% by weight Te, corresponding to the composition of the compound Ag_2Te. Products of electrolysis — sludge, electrolyte, cathodic precipitate, anode residues—examined; anodic and cathodic yields of Ag and Te determined. (P15; Ag, Te)

521-P. (Russian.) **Solubility of Zinc in the Metal Compounds Cu_2Mg and Cu_2Cd.** Ye. I. Gladyshevskiy and P. I. Kripyakevich. *Izvestiia Sektora Fiziko Khimicheskogo Analiza Institut Obshchei i Neorganicheskoi Khimii imeni Akademii Nauk,* v. 27, 1956, p. 209-211.

At 400° Cu_2Mg dissolves 39 at.% Zn, Cu_2Cd dissolves 3 at.% Zn. The difference in the ability to dissolve is explained with the aid of the Brillouin-zone theory. The experimental values of C_{e1} (1.72 and 1.35) agree with the computed ones.
(P12e; Cu, Mg, Cd, *Zn*)

522-P. (Russian.) **Some Photo-Electric Properties of Antimony Trisulfide and Antimony Triselenide.** P. P. Brazdzhyunas and M. P. Mikal'kevichus. *Lietuvos TSR Mokslu Akademiia Darbai,* v. B2, 1956, p. 31-40.

Photoconductivity and absorption spectrum of crystalline and amorphous layers of Sb_2S_3 and Sb_2Se_3 in the temperature range −70 to 235° C.; spectral and temperature dependence of photosensitivity and of absorption coefficient in the region 400-1200 milimicrons.
(P17, 2-61; Sb, *S, Se*)

523-P. (Russian.) **Radiation-Colorimetric Method of Determining the Specific Heat of Metals.** A. P. Lyubimov and D. K. Belashchenko. *Sbornik Moskovskogo Instituta Stali.,* v. 33, 1955, p. 3-11.

Method based on simultaneous measurement of the temperature of the cooling specimen and of the quantity of heat delivered by the specimen to the surrounding medium. The specimen is placed inside a double-wall quartz cover and is first heated in vacuum by high-frequency current. The heat radiated by the specimen is absorbed by cooling water flowing between the walls of the cover, and is determined from the temperature difference of the cooling water ahead and past the cover. The specific heat was determined for Fe-C, Fe-Cu and Armco-iron alloys at 250-950°.
(P12r, 2-54; Fe)

524-P. (Russian.) **Anodic Polarization of Chromium.** R. I. Agladze and T. V. Ionatamishvili. *Trudy Instituta Metalla i Gornogo Dela Akademiia Nauk Gruzinskoi SSR,* v. 7, 1956, p. 157-174.

Anodic polarization curves of Cr, Fe and ferrochrome measured for different solutions and current densities of up to 30 amp. per sq.dm. at 35° C. (P15; Cr)

525-P. (Russian.) **Certain Properties of Surface-Active Metals.** N. L. Pokrovskiy. *Zhurnal Neorganicheskoi Khimii,* v. 1, no. 6, 1956, p. 1383-1386.

The surface tension of solutions of Te in liquid Sn was measured at 250 to 550° C. Te has considerable surface activity which diminishes with increasing temperature and is commensurate with the surface activity of sodium dissolved in tin.
(P13h; Te, Sn)

526-P. **Heat Capacities, Antropies and Enthalpies of Tantalum Between 12 and 550° K.** [1,2] K. F. Sterrett and W. E. Wallace. *American Chemical Society, Journal,* v. 30, July 5, 1958, p. 3176-3177.

Heat capacities of tantalum measured between 12 and 550° K. with a precision of 0.15% or better. 12 ref. (P12r, 2-63; Ta)

527-P. **Magnetic Properties of Magnetite at Low Temperatures.** N. S. Korolevskaya and A. S. Mil'ner. *Fizika Metallov i Metallovedenie,* v. 3, no. 1, 1956, p. 186-188. (Henry Brutcher, Altadena, Calif., Translation no. 4258.)

Experimental study of cause of difference in the transformation temperatures of magnetite when cooled inside as against outside a magnetic field. (P16; 2-63, RM-n, Fe)

528-P. (Russian.) **Thermodynamics of Irreversible Processes in a Polarized Magneto-Elastic Medium.** K. B. Vlasov. *Fizika Metallov i Metallovedenie,* v. 5, no. 3, 1957, p. 385-389.

7 ref. (P12, P16)

529-P. (Russian.) **Semi-Conductivity in the Multiple Electron Theory.** E. N. Agafonova and N. P. Kontorovich. *Fizika Metallov i Metallovedenie,* v. 5, no. 3, 1957, p. 402-405.

7 ref. (P15g; EG-j)

530-P. (Russian.) **Theory of Electromagnetic Effects in Metals.** F. G. Bass, M. I. Kaganov and V. V. Slezoo. *Fizika Metallov i Metallovedenie,* v. 5, no. 3, 1957, p. 406-411.

(P16)

531-P. (Russian.) **Magnetic Properties of Magneto-Anisotropic Samples of Ferromagnetic Powders. Pt. 2. Relation of the Magnetizing Curves on the Method of Producing the Demagnetized State.** Ya. S. Shur, E. V. Shtol'ts and G. S. Kandaurova. *Fizika Metallov i Metallovedenie,* v. 5, no. 3, 1957, p. 421-427.

(P16; Fe, 6-68)

Q Mechanical Properties and Tests

942-Q.* **Steel in Prestressed Concrete.** W. O. Everling. *Blast Furnace and Steel Plant,* v. 46, July 1958, p. 691-697.

Stress strain curves, relaxation, creep and tensile properties of prestressing wire for prestressed concrete structures. Elastic properties of wire, cold drawn, stress relieved, oil tempered or lead patented. Sensitivity to stress corrosion and fatigue as demonstrated by tests in hot ammonium nitrate solutions. Protection afforded by concrete.
(Q27a, Q23b, T26p, CN-r, 4-61)

943-Q.* **Which High Strength Steel?** Robert J. Nekervis, C. H. Lund and A. M. Hall. *Materials in Design Engineering,* v. 48, July 1958, p. 84-89.

Advantages and limitations for use in aircraft; tensile strength, yield strength, creep and stress rupture properties of hot work toolsteels, martensitic stainless steels, low alloy steels, precipitation hardenable, semi-austenitic stainless steel and austenitic stainless steel.
(Q27, Q3; SS, TS)

944-Q.* **The Fatigue Strength of Specimens Cut From Pre-Loaded Blanks.** N. E. Frost. *Metallurgia,* v. 57, June 1958, p. 279-282.

Prior fatigue loading of blanks did not significantly alter fatigue strength of B.S. L65 Al specimens cut from the body (i.e., remote from pre-surface of material). Static preloading, compression or torsion caused an increase in fatigue strength for mild steel. The strength increased literally with amount of pre-strain. Similar pre-loading caused decrease in fatigue strength for alloy. 5 ref.
(Q7, Q23; Al-b)

945-Q.* **High-Strength Nonmagnetic Alloys.** *Materials in Design Engineering,* v. 48, Aug. 1958, p. 104-106.

Many applications require nonmagnetic alloys with tensile strengths about 200,000 psi. and approximately 5% elongation. The copper and cobalt-base alloys, titanium alloys, and austenitic stainless steels come closest to these values. Magnetic properties of specific alloys are discussed.
(Q-general, P16; Co-b, Cu-b, Ti-b, SS)

946-Q.* **Behavior of Certain Alloys Subjected to Dynamic Loading.** Ralph G. Crum and F. T. Mavis. *ASTM Bulletin,* no. 231, July 1958, p. 88-91.

A spring-powered impact apparatus and a data recording system for dynamic tension tests of 0.25-in. diameter specimens. Steel, Al and Ti alloys were tested statically and dynamically at constant or slightly increasing velocity from impact to fracture. Yield and ultimate strengths are greater for dynamic loading than for static loading. The ductility of specimens of a given material was essentially the same whether the specimens were loaded statically or dynamically. 6 ref.
(Q6, Q23b, Q23p; Al-b, Ti-b)

947-Q.* **The Initiation of Cleavage Fracture at the Intersection of Deformation Twins in Zinc Single Crystals.** R. L. Bell and R. W. Cahn. *Institute*

of Metals, Journal, v. 86, June 1958, p. 433-438.

Detailed observations demonstrate that the cleavage fracture of single crystals of Zn of a special orientation, tested in tension at room temperature, started at the points of high stress concentration resulting from the meeting of pairs of twin lamellae on the systems (10$\bar{1}$2) and ($\bar{1}$012). 14 ref. (Q26n; Zn, 14-61)

948-Q.* The Development of Microscopic Inhomogeneities of Deformation in Polycrystalline 70:30 Brass: Some Effects of Method of Deformation. L. E. Samuels and M. Hatherly. *Institute of Metals, Journal,* v. 86, June 1958, p. 442-446.

The incidence of two types of microscopic inhomogeneity of deformation (lamellar slip bands and kink bands) in polycrystalline 70-30 brass is found to vary markedly with different methods of unidirectional deformation. The kink-band type of inhomogeneity does not influence strain-hardening, but the slip bands do have a small influence, particularly when the bands develop on multiple systems. This is interpreted as indicating that strain-hardening is due largely to interference between intersecting slip systems. 18 ref. (Q24; Cu-n)

949-Q.* The Effect of Neutron Irradiation on the Mechanical Properties of Copper and Nickel. M. J. Makin. *Institute of Metals, Journal,* v. 86, June 1958, p. 449-455.

The yield stress of both metals is increased by irradiation, and the increase is markedly temperature-dependent, being very much greater at low temperatures than at high. The temperature variation in yield stress after irradiation is a reversible phenomenon and is not due to an annealing effect at the higher temperatures. The rate of work hardening is greatly reduced by irradiation, especially at low strains. The ultimate tensile strength is increased and the elongation to fracture is reduced by irradiation. Results are discussed in terms of the possible mechanism of irradiation-hardening. 9 ref. (Q23, Q27a; Cu, Ni, 2-67)

950-Q.* How to Make Hydraulic Tubing Last Longer. C. S. Yen and J. L. Waisman. *Metal Progress,* v. 74, July 1958, p. 88-92.

Roughness of the tube surface, amount of flattening in a bend and tensile strength are controlling factors. Careful attention to these variables is necessary if the tube system is to endure the changing stresses caused by pressure pulses. (Q7k; 4-60)

951-Q.* Molybdenum Is Here to Stay. J. L. McCloud. *Metal Progress,* v. 74, Aug. 1958, p. 75-78.

Molybdenum is pre-eminent among metals for high-temperature uses and is solidly entrenched in the electronics industry and for missile parts whose working life is very short. Protective coatings have been perfected so gas turbine blades can run at 2000° F.
(Q-general, 2-62, T24e, T1, 17-57; Mo)

952-Q.* W-545 . . . a Better Turbine Disk Alloy. J. T. Brown. *Metal Progress,* v. 74, Aug. 1958, p. 87-90.

A new iron-base turbine disk alloy having a good combination of high-temperature stress-rupture strength and ductility, and low-temperature tensile strength has been developed. Boron in amounts from 0.005 to 0.15% increases the inherent ductility of the present austenitic precipitation hardening alloys. Further strengthening, by additions of larger amounts of titanium, is then possible without allowing the material to become notch sensitive.
(Q-general, T7h, 17-57, 2-62; Fe, SGA-h)

953-Q.* Influence of Hotworking Conditions on High-Temperature Properties of a Heat-Resistant Alloy. John F. Ewing and J. W. Freeman. *National Advisory Committee for Aeronautics Report 1341,* 1957, 52 p.

An alloy containing 20% Cr, 20% Ni, 20% Co, 3% Mo, 2% W and 1% Cb was investigated. Limited isothermal deformations increase strength. Larger reductions either do not increase strength or cause a decrease. Thus, high-production processes, giving large reductions at essentially constant temperature, lead to low or medium strength in the hot worked condition. Working over a falling-temperature range, with finishing temperatures as high as 1800° F. or higher, can give very high strengths at 1200° F., equal to those usually obtained only by hot-cold-work. (Q-general, 2-62; Cr, Ni, Co, Mo, W, Cb, SGA-h)

954-Q. Fracture Types in Germanium and Silicon Crystals. V. P. Mitrenin and B. V. Aleksandriya. Paper from "Growth of Crystals", Consultants Bureau, Inc., 1958, p. 135-138.

Specific shapes of Ge and Si crystal fracture are described from observations made by electron microscopy. The crystals were fractured by moderate blows. Reciprocal lattice X-ray data were used to determine the crystallographic plane orientations. Photomicrographs show the conchoidal fracture in a Ge single crystal with clearly developed steps on the (111) plane. The steps are approximately parallel and almost right-angled fractures occur on them.
(Q26; Ge, Si, 14-61)

955-Q. Preliminary Microscopic Studies of Cermets at High Temperatures. E. T. Montgomery, T. S. Shevlin, H. M. Greenhouse and H. W. Newkirk. Ohio State University Research Foundation. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131470, Apr. 1955, 40 p. $1.25.

High-temperature (to 1800° F.) properties of the promising cermet IIIB (55.4 TiC-17.9 TiB_2-10.0 Si-16.7 Co). (Q-general, 2-62; 6-70)

956-Q. Ceramic Reinforced Alloys and Plated Cermets. M. T. Curran. New York State College of Ceramics. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131188, May 1957, 49 p. $1.25.

A precision technique was developed for casting superalloys around ceramic rod reinforcement. Electroplating of cermets with Ni and Cr improves their impact resistance. (Q-general; Cr, Ni, Mo, 6-70, 8-12, 8-69)

957-Q. Lubrication of Titanium. R. O. Lee and N. Fatica. Clevite Research Center. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131650, Dec. 1957, 51 p. $1.50.

Role of oxide films on Ti, the frictional properties of modified Ti coatings, and the comparative wear resistance of the best surface treatment in the presence of various lubricants. Tests showed Halocarbon 11-14 to be the most effective lubricant on treated and untreated surfaces. (Q9n, 18-73, 2-61; Ti)

958-Q. Development of Electroplating Processes to Eliminate Hydrogen Embrittlement in High-Strength Steel. J. E. Chilton. Stanford Research Institute. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131721, Jan. 1958, 84 p. $2.25.

Electrodeposition of Cd on a high-strength, aircraft quality steel.
(Q26s, L17; SS, *Cd*)

959-Q. Investigation of the Effects of Incongruous Elements and the Interaction Effects of These Elements on High-Temperature Strength of Fe-Co-Ni-Cr Alloys. J. H. Sye, T. L. Robertshaw and F. M. Richmond. Universal Cyclops Steel Corp. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131614, Dec. 1957, 110 p. $2.50.

Effect of five combinations of incongruous elements on the high-temperature properties of vacuum melted alloys with a base composition of 60 at. % Ni, 20 at. % Cr, 10 at. % Fe, 10 at. % Co. (Q-general; 2-62, 1-73, AD-q, Fe, *Co, Ni, Cr*)

960-Q. Effects of Temperature-Time-Stress Histories on the Mechanical Properties of Aircraft Structural Metallic Materials. Pt. 1. Temperature-Time Studies for 2024-T3 and 7075-T6 Alclad Sheet. R. E. Fortney and C. H. Avery. Northrup Aircraft, Inc. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131520, Sept. 1957, 214 p. $5.50.

Tensile properties of 2024-T3 Alclad and 707 5-T6 Alclad sheet were determined at room temperature, 200, 300 and 400° F. after single and sequential multiple exposure in the range 250 through 600° F. (Q-general, T24a; 2-62, Al-b, ST, 4-53, 8-66)

961-Q. Metals for High Temperature Hydraulics. Arne Mars and N. M. Lazar. *Aviation Age,* v. 30, Aug. 1958, p. 82-88.

Creep-rupture and fatigue strength of toolsteels and PH stainless.
(Q3, Q7, T24, 17-57; TS, SS)

962-Q. Magnesium-Lithium Alloys. *Metal Industry,* v. 92, June 6, 1957, p. 476.

(Q23p, Q27a; Mg, Li)

963-Q. (Russian.) **Sag of Turbine Shafts and Rotors in the High-Temperature Test.** M. Ya. Fuks and I. K. Glazyak. *Vestnik Mashinostroeniia,* no. 6, 1955, p. 30-34.

Tests to determine the ability of turbine shafts and rotors to maintain rectilinear axes when heated. Experimental heating tests on shaft blanks in electric furnace; influence of repeated machining and of surface condition on the temporary bending deflection of shafts.
(Q5, T7; 2-62)

964-Q.* (Russian.) **Physical Mechanism of Plastic Deformation of Polycrystalline Iron During Drawing.** Alois Mashin and Miroslav Mrazek. *Acta Technica,* v. 3, no. 3, 1958, p. 218-240.

Experiments using microscope and X-ray on 5.5-mm. Armco iron wire, (composition: 0.015% C, 0.011% Mn, 0.014% P, 0.015% S, 0.03% Ni and 0.005% N). The clearest morphological changes of grain shape took

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

place at temperatures of 44-76°. The major form of deformation is the development of creep in grain boundaries with its consequent disordered mechanism. Appearance of deformation bands is related to temperature level and not to number of times wire is drawn. 13 ref. (Q24, Q3, F28; ST, 4-61)

965-Q.* Effect of Neutron Irradiation on the Mechanical Properties of Copper and Nickel. M. J. Makin. *British Nuclear Energy Conference, Journal,* v. 3, July 1958, p. 174-180.

Effect of neutron irradiation at 100° C. with 5 × 10^{19} n. per sq. cm. on the mechanical properties of annealed polycrystalline Cu and Ni is studied at a variety of temperatures. The yield stress of both metals is increased by the irradiation, and the increase is markedly temperature-dependent, being very much greater at low temperatures than at high. 10 ref. (Q-general; Cu, Ni, 2-67)

966-Q.* Electron Microscope in the Study of Wear. D. Scott and H. M. Scott. *Electron Microscopy, Proceedings of the Stockholm Conference,* Sept. 1956, p. 331-333.

Replica techniques permit detailed examination of worn areas, effects of fretting corrosion, lubricants, study of debris. 8 ref. (Q9n, M20r; ST, TS)

967-Q.* Transgranular and Intergranular Fracture of Ingot Iron During Creep. L. A. Shepard and W. H. Giedt. *National Advisory Committee for Aeronautics, Technical Note 4285,* Aug. 1958, 32 p.

Creep tests were performed on coarse-grained ingot iron over a temperature range from 700 to 1350° F. to find whether the amount of grain-boundary sliding determined the fracture mode, either transgranular or intergranular. 24 ref. (Q26; Fe)

968-Q.* Effect of Temperature on Dynamic Modulus of Elasticity of Some Structural Alloys. Louis F. Vosteen. *National Advisory Committee for Aeronautics, Technical Note 4348,* Aug. 1958, 21 p.

Effect of temperature from 70-900° F. on Young's modulus of 2024-T3 and 7075-T6 Al alloys, AZ31A Mg alloy, RS-120 Ti alloy, and Type 303 stainless steel. 15 ref. (Q21a, 2-61; Al-b, SS, Ti-b, Mg-b)

969-Q. Energy of a Deformed Crystalline Lattice. N. S. Fastov. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 257-264. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

During plastic deformation the greatest part of the total work spent on deformation is dissipated as heat and only a certain part (not more than 10-15%) is transformed into energy of residual stresses—energy of second and third order deformation of the lattice. The overwhelming proportion of the energy of residual stresses is absorbed by third order deformations. During deformation the metal becomes stronger and this strengthening is always accompanied by second and third order deformations. As the degree of plastic deformation increases, the strengthening coefficient decreases. 8 ref. (Q24, M26)

970-Q.* Internal Friction. Stress Relaxation Across Interfaces. P. M. Robinson and R. Rawlings. *Iron and Steel,* v. 31, Mar. 1958, p. 97-100.

Important source of internal friction is stress relaxation across incoherent interfaces, such as grain boundaries and interfaces between different phases. Various investigations and observations on dampening due to relaxation across the grain boundaries are cited. Internal friction due to defects in metals, such as dislocations and vacancies. 51 ref. (Q22)

971-Q. Effect of Alloying Admixtures on the Temperature Dependence of the Shear Modulus of Iron. N. S. Rysina and B. N. Finkelshtein. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 289-293.

The shear modulus of pure iron, as well as that of Fe alloyed with Co, V or Mn, starts diminshing rapidly at 360°; in Mo steel the modulus remains relatively high to 480°. Above 560°, the modulus of pure Fe drops fastest, while V exerts the maximum detaining action on the reduction in the modulus at these temperatures. (Q21d, 2-60; Fe, *Co, V, Mn, Mo*)

972-Q.* (Czech.) **Mechanical Properties of the Hardened Layer of Cast Iron Rolls.** Robert Kamensky. *Hutnicke Listy,* v. 13, 1958, p. 502-505.

Effect of alloy contents and distance from surface on mechanical properties of cast iron rolls. Greatest strength found on external border of hardened layer. Strength fell rapidly in direction of roll center as consequence of grain growth in hardened layer. In transition layer strength increased with graphite content. Modulus of elasticity decreased from surface to center of the roll. Alloying with Mo increased strength of hardened layer and decreased its modulus of elasticity. (Q29, Q-general, W23k, 2-60; CI)

973-Q.* (Czech.) **Morphology of a Brittle Structural Component Formed During Resistance Welding of Low-Carbon Steels.** Dasaalvan Hrivnak. *Hutnicke Listy,* v. 13, 1958, p. 512-517.

Electron microscope investigation reveals two morphological groups of brittle compound, one without regular design and the other with fine martensitic design. Modification of component characterized by granular substructure; suggests substructure is an orthorhombic unstable crystallization. 4 ref. (Q26s, M27, M21e, K3; CN)

974-Q.* (Czech.) **Contribution to the Problem of Longitudinal Crack Formation in Rail Foot After Straightening.** Slavomir Horejs. *Hutnicke Listy,* v. 13, 1958, p. 517-526.

Factors contributing to cracking include severe straining during straightening; undersurface bubbles, laminated flat and unfavorably oriented to the surface, fibers in middle sphere of rail foot oriented perpendicular to surface. 27 ref. (Q26q, T23q; ST)

975-Q.* (French.) **Formation of Sound Waves in Metal Specimens During Tension Tests.** J. B. Lean, J. Plateau, C. Bachet and C. Crussard. *Comptes Rendus,* v. 246, May 19, 1958, p. 2845-2848.

Tension tests were carried out on specimens of extra-mild steel at temperatures ranging from +200 to −196° C. Sound waves are emitted during formation of Luder's lines or waves of plastic deformation corresponding to Portevin-LeChatelier effect. Brittle fracture at low temperature, without appreciable elongation, is preceded by identical sound waves. 4 ref. (Q27, Q21f; ST)

976-Q.* (German.) **Creep and Tension Loss of Steel Wire, Particularly at Slightly Elevated Temperatures.** Werner Papsdorf and Fritz Schwier. *Stahl und Eisen,* v. 78, July 10, 1958, p. 937-947.

Tests at 22 to 150° C. indicate that creep or loss of tension is a function of heat, load and time. Increasing temperatures, at 55 to 60% load, increase the loss of wire tension up to 1000 hr. Beyond this point, the influence of temperature on tension loss decreases; the same occurs when load is increased at constant temperature. Nature and extent of creep can be projected and trend of tension determined over 100 years. Properties of steel wire are subject to alterations after creep tests have been conducted under heavy loads, and this has been found to be in conformity with the theory of creep at room temperature. 31 ref. (Q3, Q27a; ST, 4-61)

977-Q.* (Japanese.) **Austenitic Stainless Steel Tubes for High-Temperature and High-Pressure Boilers.** Toshio Ikeshima, Jimpel Omori, Toyohiko Okamoto, Eiji Miyoshi, Shoji Terai and Hidetoshi Maruoka. *Sumitomo Metals,* v. 10, Jan. 1958, p. 9-30.

Manufacture of tubes from Types 321 and 327 stainless steels for use in superheaters in modern power boilers. Mechanical properties, tube dimensions and microstructure at room temperature. Mechanical properties at elevated temperatures (400 to 800° C.), creep-rupture properties, effect of long-time heating on brittleness and other mechanical properties, oxidation resistance, microstructure following heating. Microstructure and mechanical properties of joints made by arc welding and inert-gas shielded-arc welding utilizing various electrodes before and after prolonged exposure to high temperatures. Influence of severe cold bending on tube dimensions, mechanical properties and microstructure. (Q-general, 2-62, T26q; SS, 4-60)

978-Q.* (Japanese.) **Fatigue Test Results With Large Shouldered and Force-Fitted Specimens.** Naoteru Oda and Kunio Nishioka. *Sumitomo Metals,* v. 10, Jan. 1958, p. 37-44.

Investigation of fatigue limit of stress concentration portion of railway car axles. Radius of fillet, specimen dimension and cracking corrosion related to the fatigue strength. 12 ref. (Q7k, Q7b, T7j; ST)

979-Q.* (Japanese.) **Rotating-Beam Fatigue Test of Cast Aluminum Alloys.** Katsuzi Takeuchi. *Sumitomo Metals,* v. 10, Jan. 1958, p. 45-54.

Tests on Alcoa 195, Lautal, SAE 326, SAE 329, Silumin, Gamma-Silumin, SAE 331, Alcoa 356, Y-alloy, Cobitalium, Hydronalium, Low-EX, Alcoa D 132 and RR 53 cast alloys in the ascast and heat treated conditions. Relation between fatigue strength at 10^7 cycles and tensile properties. Fatigue strength increased with increment of tensile strength up to 32 kg. per sq. mm., then decreased with further increment of tensile strength. 4 ref. (Q7c, Q27a; Al-b, 5-60)

980-Q.* Thick-Walled Steel Cylinders. Behavior Under Internal Pressure. B. Crossland and J. A. Bones. *Machinery Market,* July 31, 1958, p. 17-20.

Test on thick-walled cylinders made from 0.15% C steel, 0.3% C steel and Vibrac steel, the maximum pressure reached being 42 tons per in. (Q10; CN, 4-60, 3-74)

981-Q. On the Plastic Properties of Modified Steel Kh25N20 in the Cast State. V. E. Neimark and Ya. B. Gurevich. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 439-449. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Modification of steel Kh25N20 with Ti or B improves its plastic properties in the hot state. Cast steel Kh25N20 with columnar structure has good plastic properties at room temperature, which makes it possible, with suitable tolerances for the castings, to work it in the cold state. Diffusion anneal (1250° for 1 hr.) destroys the dendrite eliquation in the cast steel and improves its plastic properties at room temperature. 24 ref.
(Q23, 2-62, 2-60; AY, *Ti, B*)

982-Q. On the Deformability of Cast Steel of Type Kh25N20. Ya. B. Gurevich and V. E. Neimark. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 450-456. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Under definite conditions of working, cast steel of type Kh25N20 with columnar macrostructure has adequately high plasticity both in the hot and the cold state. The cast metal needs to be subjected to a diffusion anneal at 1250° to remove the dendrite eliquation and destroy the chi-phase, followed by cooling in water to prevent the separating out of carbides on the grain boundaries. The allowable reduction in hot rolling is 60 to 65%. 10 ref.
(Q23q, 2-62, 2-64; ST, 5-60)

983-Q.* The Influence of Ferrite Banding on the Impact Properties of Mild Steel. W. S. Owen, Morris Cohen and B. L. Averbach. *Welding Journal,* v. 37, Aug. 1958, p. 368s-374s.

Object was to compare the Charpy properties of a severely banded ferrite-pearlite structure with those of a random ferrite-pearlite distribution. Ferrite banding in reheated hot rolled mild steel is influenced by the austenitizing temperature, the time at temperature and the cooling rate. Once the banding has been completely removed by a homogenizing heat treatment, it is not re-formed by thermal treatment. 10 ref. (Q6n, Q24c, 2-64; CN)

984-Q.* Material Rating Based Upon True Stress-Strain Properties. Joseph Marin and M. G. Sharma. *Welding Journal,* v. 37, Aug. 1958, p. 375s-378s.

Interpretations were based upon data for 56 materials. Material ratings based upon the nominal and true properties are not the same. Recommended that ratings be based upon true stress-strain relations. 11 ref. (Q27, Q25n, S22)

985-Q.* (Russian.) **Study of Physical Factors Determining Hardness of Iron Alloys.** V. M. Golubkov, V. A. Il'ina and V. I. Kritskaya. *Fizika Metallov i Metallovedenie,* v. 5, no. 5, 1957, p. 465-483.

Relationship between thin crystal structure of hard alloys (using alpha-iron in hardened condition) and mechanical properties. The alloys were hardened by cold plastic deformation. To change the properties of alpha-iron crystals in the micro and submicro regions, the iron was alloyed with Si, Ti, V, Cr, Mn, Co, Ni, Nb, Mo and W. Static and dynamic displacements of atoms in crystal lattice were studied by X-ray. 38 ref.
(Q29n, M25, M26, 3-68; Fe-b)

986-Q.* (Russian.) **Effect of Static Distortion of Crystal Lattice on Mechanical Properties of Aluminum and Magnesium Alloys.** A. V. Grin', V. A. Pavlov and I. A. Pereturina. *Fizika Metallov i Metallovedenie,* v. 5, no. 5, 1957, p. 493-500.

Thermal dependence of the yield point and temporary resistivity of pure Al and its alloys at temperatures of 80 to 700° K. during 100-fold increase in speed of deformation. For pure Al at a temperature of 500° K., the relation between yield point and modulus of elasticity are not affected by temperature. However, a further rise in temperature increasingly affects this relationship. 23 ref.
(Q21a, Q23b, M26s, 2-61; Al-b, Mg-b)

987-Q. Plasticity of Heat Resistant Alloys Depending on Structure and Kind of Stressed State. M. V. Rastegaev. *Metallovedenie i Obrabotka Metallov,* July 1958, p. 30-35. (Henry Butcher, Altadena, Calif., Translation no. 4280.)

Plasticity of heavily deformed alloys, at the time of deformation at high temperatures and under expansion pressures, depends mainly on the form of diffusion of the second phase not in its original structure but in the structure formed during heat treatment at the moment of the start of deformation. 9 ref.
(Q24, N1, 2-62, 2-64, 3-74; SGA-h)

988-Q. Structure and Properties of Alloys After Vibrational Deformation. S. N. Shestakov and M. Ya. Karnov. *Metallovedenie i Obrabotka Metallov,* July 1958, p. 35-38. (Henry Brutcher, Altadena, Calif., Translation no. 4281.)

Deformation by vibration results in more uniform macro and microstructure and smaller grain formation after recrystallization. Also there is greater uniformity in the hardness after vibration and lowered specific pressure. Vibro-deformation can also be used to reduce intersurface friction. Rejects common assumption that the vibration of machinery and material during usual operations is invariably harmful.
(Q24, Q29n, M27c, M28k, 3-74)

989-Q.* On Asperity Distributions of Metallic Surfaces. F. F. Ling. *Journal of Applied Physics,* v. 29, Aug. 1958, p. 1168-1174.

A distribution of surface asperities is proposed for the case in which both mating surfaces are rough and asperities are in the form of right circular cones. The load-compliance characteristics for mating surfaces having comparable roughness have slopes much steeper than those predictable by previous theories, all of which involve the assumption that one of the surfaces is smooth and rigid. 12 ref.
(Q9p, S15; ST, Al, Cu-n, 10-52)

990-Q.* Investigation of Low-Temperature Internal Friction. Hollis L. Caswell. *Journal of Applied Physics,* v. 29, Aug. 1958, p. 1210-1214.

Internal friction in pure copper, in Cu doped with Ni and Au, and in Mg, subjected to various amounts of cold work was measured at 40 kc. from 4° K. to 300° K. 11 ref.
(Q22; 2-63, Cu, Mg, *Ni, Ag*)

991-Q. (Russian.) **On the Problem of the Nature of Reversible Temper Brittleness.** L. R. Gold'shtein. *Metallovedenie i Obrabotka Metallov,* no. 11, 1956, p. 36-39.

Electron microscope and electron diffraction study of temper brittleness in steel 33 KhNZ after oil quenching from 1150° C. followed by tempering at 600 and 675° C., with different cooling rates. Destructive testing produced brittle fracture after slow cooling and ductile after rapid cooling. In both cases carbide particles were present on the fracture face. It is suggested that one of the causes of reversible embrittlement is the healing and development of breaks in the primary austenite grain boundaries as a result of the volume changes occurring during tempering, mainly in the alpha-phase and depending on the nature and amount of alloying elements. (Q26s, 2-64; AY)

992-Q. Solve Lamellar Phase Problem in A-286. Kenneth Metcalfe. *Iron Age,* v. 182, July 3, 1958, p. 72-74.

Formation of lamellar precipitate at grain boundaries results in lower stress-rupture life of A-286 stainless alloys. Lamellar phase eliminated by controlling boron content or solution treatment at 2000° F.
(Q3m, N7; SS-e, *B*)

993-Q. Thermal Stresses in Design. S. S. Manson. *Machine Design,* Aug. 7, 1958, p. 100-107.

Stress-strain mechanisms; quantitative analysis; failure by plastic-strain cycling; metallurgical aspects. 11 ref. (Q25p, 17-51)

994-Q. Investigations on the Rolling and Recrystallization Textures of Carbonyl-Iron. Frank Haussner and Helmut Weik. *Archiv für das Eisenhüttenwesen,* v. 27, Mar. 1956, p. 153-160. (Iron and Steel Institute Translation no. 997.)

Previously abstracted from original. See item 389-Q, 1956.
(Q24, N5, CN)

995-Q. Indication of the Tendency to Brittle Fracture of Steels by Measurement of Yield Stress, Tearing Stress and Contraction on Fracture, on Tri-Axially Stressed Specimens. Albert Kochendorfer and Christof Rohrbach. *Archiv für das Eisenhüttenwesen,* v. 26, Apr. 1955, p. 213-227. (Iron and Steel Institute Translation no. 800.)

Previously abstracted from original. See item 568-Q, 1955.
(Q23b, Q26s; ST)

996-Q. New Experimental Results Concerning the Importance of the Surface Effect on Fatigue. O. Lissner. *Jernkontorets Annaler,* v. 140, 1957, p. 380-389. (Iron and Steel Institute Translation no. 996.)

Previously abstracted from original. See item 1068-Q, 1957.
(Q7; AY)

997-Q. (French.) **Influence of Welds on the Behavior of Metal Products.** Pierre Roblin. *Revue de la Mecanique,* no. 109, Mar. 1958, p. 127-131.

(Q-general; 7-51, 17-51)

998-Q. (German.) **How to Determine the Right Value for Resistance in**

Triaxial Plastic Deformation. Zygmunt Wusatowski. *Freiberger Forschungshefte,* v. B27, 1958, p. 5-27.

A mathematical study based on the change in shape of the object deformed. The values obtained by measuring are used for computing the stresses and the resistance to deformation. 52 ref. (Q24)

999-Q. (Russian.) **Influence of Magnesium on Mechanism of Plastic Deformation of Aluminum-Magnesium Alloys.** V. I. Syutkina and E. S. Yakovleva. *Fizika Metallov i Metallovedenie,* v. 5, no. 5, 1957, p. 501-507.

Concentration of Mg atoms on the Al grain boundaries accounts for its increasing hardness. 13 ref. (Q24, Q29n, 2-60; Al, *Mg*)

1000-Q. (Russian.) **Effect of Phase Disintegration of Supersaturated Hard Alloys on Plastic Deformation.** N. F. Syutkin. *Fizika Metallov i Metallovedenie,* v. 5, no. 5, 1957, p. 508-515.

Study of intermittent plastic deformation of cylindrical objects made of Zn with 20% Al. The first "skipping" in the deformation appears at the very beginning of the rectolinear part of the ascending section of the tension diagram. 6 ref. (Q24, 2-60; *Al,* Zn-b)

1001-Q. (Russian.) **Evaluation of Impact Ductility and Cold Brittleness in Zone Adjacent to Weld.** M. M. Kraichik. *Svarochnoe Proizvodstvo,* July 1958, p. 27-29.

5 ref. (Q23p, Q26s, K9r)

1002-Q. (Russian.) **Determination of Tensile Strength of Steel at Low Temperatures.** L. S. Livshits and A. S. Rakhmanov. *Zavodskaya Laboratoriya,* v. 24, May 1958, p. 622-625.

Method consists of device which measures effect of temperature variation on copra pendulum. (Q27, 2-63, 1-53; ST)

1003-Q. (Russian.) **Precise Measurement of Microhardness by Chemical Removal of Case Hardened Surface Layers.** V. N. Vigdorovich and A. E. Vol'pyan. *Zavodskaya Laboratoriya,* v. 24, June 1958, p. 762-764.

Use of various etching solutions in testing surface of Cu alloys. For Cu-Al an etch solution of $FeCl_3$ in HCl is recommended; for Cu-Ti alloy, etch with $K_2Cr_2O_7$ plus NaCl in H_2SO_4. 5 ref. (Q29q, 1-54)

1004-Q. (Russian.) **Effect of Bending During Torsion Tests.** B. A. Vandyshev and E. E. Surikova. *Zavodskaya Laboratoriya,* v. 24, June 1958, p. 764-767.

Recommends clamping device to overcome destructive effect of torsion tests. 7 ref. (Q1, 1-53)

1005-Q. A Phenomenological Relation Between Stress, Strain Rate and Temperature for Metals at Elevated Temperatures. Elbridge Z. Stowell. *National Advisory Committee for Aeronautics, Report 1343,* 1958, 6 p.

Phenomenological relation is suggested to account for behavior of polycrystalline metals above the equicohesive temperature. Properties of the metal included in the relation are elasticity, linear thermal expansion and viscosity. 9 ref. (Q25n, Q21, P10d, P10f; Al-b, 2-62)

1006-Q. Chromium-Nickel Alloys for High-Temperature Applications. A. G. Bucklin and N. J. Grant. Massachusetts Institute of Technology. (U. S. Bureau of Aeronautics.) *U. S. Office of Technical Services,* PB 131465, 1955, 18 p. $.50.

Chromium-nickel alloys containing 35 to 70% Cr with additions of Fe, Mo and Cb were precision cast and tested in stress-rupture at 1600 to 1800° F. Characteristics said to surpass those of many commercial alloys were obtained, especially in alloys containing 40 to 45% Cr, 2 to 10% Fe, 2% Mo and 2% Cb. Higher Cr alloys exhibited high hardenability, suggesting high-temerature bearing applications. (Q-general, 2-62, 17-57; SGA-h, Cr, Ni, 5-62)

1007-Q. Theory of Creep of Dispersion-Hardened Alloys. J. Weertman. Naval Research Laboratory. *U. S. Office of Technical Services,* PB 131675, Apr. 1958, 11 p. $.50.

Introduction of a finely dispersed second phase into a metal matrix is said to be the best method of improving creep resistance. The dispersed second-phase particles act as obstacles to the motion of dislocations and thus harden the alloy. This research was concerned with development of creep equations for two-phase dispersion-hardened alloys. All calculations were based on the assumption that the rate-controlling process is the climb of dislocations over second-phase particles. (Q3, N7)

1008-Q.* (English.) **Some Observations on Deformation Structures in Hand Impact Tools and in Splinters From Such Tools.** Axel Hultgren. *Jernkontorets Annaler,* v. 142, no. 5, 1958, p. 229-245.

Deformation structures showing indications of shearing heat causing transformation to austenite in a thin layer followed by martensite formation. (Q24c, Q24m, N8f, N8p, 3-68, 3-71; CN-p)

1009-Q.* (French.) **Structural Theory of Metallic Creep.** A. Oding. *Revue de Metallurgie,* v. 55, May 1958, p. 448-452.

Starting from the dislocation concept, a theory of creep is developed according to which the creep rate depends on the number of dislocations ready to begin movement. A general equation for the creep curve, in agreement with experimental data, is derived. (Q3, 10-51)

1010-Q.* (French.) **Rheological Aspects of Hardness.** A. Braun. *Revue de Metallurgie,* v. 55, May 1958, p. 470-474.

Three categories of the properties of solids are distinguishable: elasticity, plasticity and viscosity. Analysis of behavior at local deformations set up by stresses to which solid offers a resistance, which is designated hardness, shows necessity of defining hardness related to the above three categories. Their significance flows from their relation with the respective constants of elastic, plastic or viscous matter, a relation which is called "hardness function" and which shows also whether these hardnesses are dependent on experimental conditions. (Q29)

1011-Q.* (French.) **Fatigue Under Fretting Conditions.** A. J. Fenner and J. E. Field. *Revue de Metallurgie,* v. 55, May 1958, p. 475-485.

Direct stress fatigue tests on Al alloy and on mild steel, both without clamps and under various conditions of clamping. Fretting was caused by the alternating strain in that part of the specimen spanned by the clamps, leading to reduction in fatigue strength. In Al the amount of this reduction was found to depend on the amplitude of the relative movement between clamps and specimen. 7 ref. (Q7, Q9q)

1012-Q.* (French.) **Investigation of Intercrystalline Fragility in Iron.** C. Bealieu. *Revue de Metallurgie,* v. 55, May 1958, p. 495-499.

Determination of temperature conditions and time of annealing required for brittleness. Brief elevation of temperature above A_3 or any modification of the structure of the specimen suffices to eliminate this brittleness. Various explanations of this phenomenon, which is different from brittleness, obtained after saturation with cathodic hydrogen. The fracture source would be due to formation of accumulations of dislocations and microfissures in vicinity of oxide precipitates or grain boundaries where cohesion is reduced. (Q26s; Fe)

1013-Q. (Russian.) **Effect of Local Plastic Deformation on the Strength of Steel.** A. E. Asnis. *Avtomaticheskaya Svarka,* no. 3, 1956, p. 88-94.

Effect of local cold work on static and fatigue strength of rimming and killed bessemer steel BST3 and openhearth steels MST3 and M16c. Tests were carried out at +20 and −20° C. As a result of local cold work by both shearing and punching the yield point of all the steels tested in tension rose by 5-12% while the ultimate tensile strength was reduced by almost 20% in BST3 and M16c and by not more than 8% in MST3. The effect was particularly pronounced at low temperature. Normalizing removes the effects of local cold work and almost completely restores the tensile properties. (Q27a, Q7a, 3-68; ST)

1014-Q. (Russian.) **Investigation of Plastic Properties of Beryllium Monocrystals.** R. I. Garber, I. A. Gindin, V. S. Kogan and B. G. Lazarev. *Fizika Metallov i Metallovedeniye,* no. 3, 1955, p. 529-537.

Mechanism of slipping of Be depends substantially on the temperature and orientation of the specimen. The plasticity of Be, which increases monotonically with temperature, reaches a maximum at 400° C., diminishes somewhat at 600° C., and increases again at 800° C. (Q24, 3-72; Be)

1015-Q. (Russian.) **Plastic Deformation in an Isotropic Metal Under Complex Loading.** A. M. Zaukov. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk,* 1956, p. 72-87.

Test pieces were of Cr-Ni steel 30KhNZA with 0.30% C, 0.37% Si, 0.64% Mn, 0.74% Cr, 2.9% Ni. Pieces were oil quenched from 820° C. and tempered at 540° C. After soaking for 2 hr. one batch was oil quenched, while the other was held for another 10 hr. at 500° C. and then furnace-cooled. Reduction of impact value by half as a result of heat treating the steel does not affect its plastic properties under complex loading conditions. (Q24, 2-64; AY)

1016-Q. (Russian.) **Problem of Changes of Intensity of X-Ray Lines During the Deformation of Polycrystals.** B. I. Smirnov. *Zhurnal Tekhnicheskoi Fiziki,* no. 1, 1957, p. 218-220.

Changes in intensity of X-ray diffraction lines were measured during the deformation of polycrystal-

line Armco Fe. Cylindrical specimens previously vacuum-annealed at 600° C. were deformed in compression perpendicular to the axis, in steps of a few per cent. After each step, X-ray exposures were made on the lateral surfaces of the specimens. The (110), (220), (211) and (220) lines were studied. The specimen was not rotated during the exposure, its axis being set perpendicular to the axis of rotation of the counter. (Q24, M22g; Fe)

1017-Q.* (Swedish.) **Veining in Ferrite.** A. Hultgren, A. Josefsson, E. Kula and G. Lagerberg. *Jernkontorets Annaler,* v. 142, no. 4, 1958, p. 165-202.

Deformation of hot worked steels. Veining or subboundary network showed greatest regularity of direction and was more closely meshed the higher the rate and the lower the temperature of deformation. Large grain size favored regular sub-boundaries. Three modes of etching of sub-boundaries, ridge veins, groove veins and level veins occurred together in a grain section under certain conditions, depending on orientation of section, carbon or nitrogen content and rate of cooling. Minimum amount of dissolved carbon or nitrogen was required for appearance of ridge vein; vein increased with an increase of these elements. Sub-boundaries in (100) sections always appear as groove veins. Level veining caused by differences in orientation between adjacent subgrains. 21 ref. (Q24, M26c, M27f, 2-60, 2-59, 3-68; CN-d)

1018-Q. Crack Propagation Tests of High-Strength Sheet Steels Using Small Specimens. J. E. Srawley and C. D. Beachem. Naval Research Laboratory. *U. S. Office of Technical Services,* PB 131682, Apr. 1958, 30 p. $1.

Test for high-strength sheet materials for current and projected rockets and high-speed aircraft provide a means of distinction between materials which could be expected to behave reliably in highly stressed structures and those which would be sensitive to minute stress-raisers. (Q26q, 1-54; ST, 4-53, SGB-a)

1019-Q. Cast Age-Hardenable Austenitic Steels. E. A. Lange, N. C. Howells and A. Bukowski. Naval Research Laboratory. *U. S. Office of Technical Services,* PB 131733, May 1958, 16 p. $.50.

Cr-Ni-P, Cr-Mn and Cr-Ni-Mn-V types of age hardenable, austenitic steels which have high strength in wrought forms were investigated for use as high-strength, nonmagnetic castings. A Cr-Ni-P austenitic steel with 0.3% C and 0.25% P developed yield strength at the 100,000-psi. level. The Cr-Mn austenitic steels containing phosphorus or vanadium were age hardenable, but castings of these alloys were brittle when heat treated to high strength. (Q27a; SS, 5-60; SGB-a)

1020-Q. (Russian.) **Creep of Aluminum Under Dynamic Loads.** A. A. Presvoditelev and B. A. Smirnov. *Vestnik Moskovskogo Universiteta,* no. 3, 1956, p. 51-55.

Creep tests of Al subjected to additional impact-pulsating loads. The load, produced by an eccentric mechanism, was applied to the lower jaw and the static load was applied to the upper one. Deformation was determined photographically using a system of mirrors. (Q3, 1-54, 1-53; Al)

1021-Q. Final Report—Development and Testing of Air-Melted Nickel-Molybdenum Alloys With Minor Alloying Additions. O. Preston, C. F. Floe and N. J. Grant. *U. S. Atomic Energy Commission ORNL-2520,* 1958, 41 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.25.

Stress-rupture, tensile and embrittlement testing of six 4800-lb. air-melted experimental heats of Ni-Mo alloys containing 13 to 20% Mo with additions of Mn, Fe, Si, Cr, Al, Ti, W, Cb and C. Results for commercial Hastelloy B included for purposes of comparison. Addition of minor alloy elements is effective in eliminating the embrittlement previously reported. (Q-general, Q26s, 2-60; Ni, Mo)

1022-Q. (Polish.) **On the Possibility of Replacing Long-Time Creep Tests by Short-Time Tests.** W. Tomaszczyk. *Hutnik,* v. 23, no. 12, 1956, p. 459-462.

Use of Larson-Miller method for determining service life of certain austenitic steels of Cr-Mo, Cr-Mo-V and Cr-Ni-W-Mo types. The constant C in the cases analyzed varies in the range 17-24. When the proper value is taken for C the steels analyzed obey the Larson-Miller relationship well for drops in temperature of up to 200° C. (Q3; AY)

1023-Q. (Russian.) **Mechanism of the Influence of Phosphous and Molybdenum Additions on Temper Brittleness of Steel.** V. I. Arkharov, S. I. Ivanovskaya, N. M. Kolesnikova and T. A. Fofanova. *Fizika Metallov i Metallovedeniye,* v. 2, no. 1, 1956, p. 57-65.

Specimens of Cr-Ni structural steel with normal and higher content of P (within its solubility limits) were heat treated to produce a brittle state. P content is substantially higher in the surface layer of brittle fracture than in that obtained in impact fracture. Analogous results were obtained with steels of the same composition, but with Mo added. (Q26s, 2-60; AY, *P, Mo*)

1024-Q. (Russian.) **Concerning the Additiveness of Mechanical Properties of Metallic Alloys and Mixtures.** Ye. M. Savitskiy and V. V. Baron. *Izvestiya Sektora Fizika Khimicheskogo Analiza IONKh Akademii Nauk SSSR,* v. 27, 1956, p. 86-96.

Using the systems Mg-Si, Mg-Ge, Cu-Si, Al-Cu, Ni-Si and Co-Si as examples, it is shown that the mechanical properties of two-phase metallic mixtures depend substantially on the mutual distribution of the structure of components in these mixtures. (Q-general, 3-71)

1025-Q. (Russian.) **Heat Resistance of Alloys of the Quaternary System Nickel - Chromium - Aluminum - Columbium.** I. I. Kornilov and L. I. Pryakhina. *Issledovaniya po Zharoprochnym Splavam. M., Akdemii Nauk SSSR,* v. 27, 1956, p. 138-147.

The maximum heat resistance is produced by those compositions of quaternary alloys corresponding to the transition region from solid solutions to alloys having a heterogeneous structure. These alloys have a structure of saturated and supersaturated solid solutions with finely dispersed segregation of the excess phase. (Q-general, 2-62, M27; Ni, Cr, Al, Cb)

1026-Q. (Russian.) **Effect of Superheat Temperature and the Introduction of Magnesium on the Properties of Spheroidal Graphite Cast Iron.** E. E. Farafonov and M. S. Kolmakova. *Liteinoe Proizvodstvo,* no. 3, 1957, p. 14-16.

Low-temperature introduction of Mg and high temperature of superheat of the metal improves mechanical properties and quasi-isotropy of spheroidal graphite cast iron. (Q-general, E25q; CI-r)

1027-Q.* (Russian.) **Effect of Steel Composition on Formation of Hot Cracks in Castings.** N. A. Trubitsyn and P. I. Bidulya. *Liteinoe Proizvodstvo,* June 1958, p. 22-26.

Study of microstructure of low-alloy steels with varying sulphur contents shows that, regardless of the steel's identical content of carbon and phosphorus, the greater the sulphur content the greater the tendency toward hot crack formation because sulphur increases nonmetallic inclusions in grain boundaries. The ratio of Mn to S does not alter these conclusions. 10 ref. (Q26q, 2-60; ST, *S*, 5-60, 9-69)

1028-Q. (Russian.) **Study of Impact Fatigue.** N. N. Davidenkov and E. I. Belyaeva. *Metallovedenie i Obrabotka Metallov,* v. 11, 1956, p. 4-10.

Static and impact fatigue was studied on specimens of steels KDLVT (cast) and U8 in the annealed condition, normalized steel 45Kh, fully tempered steels 45Kh, 30Khgsa, KDLVT (cast and forged), 55GS and U8. In the impact tests the strain rate was 10 times faster than in the static tests. The value of stress in the static tests was measured by means of the bending moment. The dynamic coefficient is 1.14.19 for steels in the annealed condition, 0.97-1.01 for the normalized and fully tempered conditions, 0.90-0.91 for the medium-tempered condition, and 0.80-0.91 for the low-temperature tempered condition. This descending order is explained by the part played in the hardening of the steel by carbide hardening which occurs less readily as the strain rate increases. 14 ref. (Q7, 1-54; ST)

1029-Q. (Russian.) **Relaxation of Oriented Micro-Stresses. Pt. 1.** B. M. Rovinskii and V. G. Liuttsau. *Zhurnal Tekhnicheskoi Fiziki,* no. 2, 1957, p. 345-350.

Investigated by studying the relaxation of elastic deformation of the lattice in metals under simple extension, using cylindrical test pieces of pure Al (99.99%) and Cu (99.92%) having a mean grain size of about 0.02 mm. (Al) and 0.05 mm. (Cu). Character of the relaxation processes in both micro and macrostresses is essentially identical. Both processes of relaxation are achieved basically as a result of elemental shifts in the crystal grains. (Q21, Q25; Al-a, Cu-a)

1030-Q. (Ukrainian.) **Effect of the Machining of Steel on Its Fatigue Strength.** G. V. Karpenko and A. I. Yatsyuk. *Dopovidi Akademii Nauk Ukrains'koi SSR,* v. 1, 1957, p. 23-26.

Effect of ordinary machine turning, heavy turning, grinding and roll-peening on fatigue strength of

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

cylindrical specimens in steel U8A quenched to sorbite, normalized steel 45 and steel 20Kh. Heavy turning lowers the fatigue strength in air and even more in water. Subsequent grinding to small tolerances does not remove the ill effects of heavy turning. Roll-peening considerably increases the fatigue strength after all forms of machining, but especially after heavy turning. (Q7a. G17, G23n; ST)

1031-Q. (Russian.) **Intergranular Cracks in Steel Castings.** D. K. Butakov. *Liteinoe Proizvodstvo,* June 1958, p. 20-22.

Steels with structurally free ferrites which are distributed on the surface of austenitic crystals have tendency to form cracks. 7 ref. (Q26p, M27; ST, 9-72)

1032-Q. A High-Temperature Vacuum and Controlled Environment Fatigue Tester. G. J. Danek, Jr., and M. R. Achter. Naval Research Laboratory. *U. S. Office of Technical Services,* PB 131737, May 1958, 12 p. $.50.

Equipment for reverse-bending fatigue tests at elevated temperatures in vacuum. Large strain amplitudes at low frequencies are used to produce failures in approximately 10^5 cycles. Equipment may be used for metallographic investigations of fatigue damage and crack initiation and growth at elevated temperatures. A major design problem, the transmission of motion through a vacuum seal, was circumvented by the use of a magnetic coupling driven at the resonant frequency of the specimen. (Q7, 1-53, 1-73)

1033-Q. Internal Friction in Deformed Alloys of Aluminum With Magnesium. A. V. Grin and V. A. Pavlov. *Physics of Metals and Metallography,* v. 4, no. 1, 1957, p. 81-87. (Translation by Pergamon Institute.)

Previously abstracted from original. See item 1057-Q, 1957. (Q22, 3-68; Al, Mg)

1034-Q. Investigation of the Deformation of Metals Under Small Stresses on Some Regularities of Creep in Copper and Aluminum. B. Ya. Yampolski and T. A. Amfiteatrova. *Physics of Metals and Metallography,* v. 4, no. 1, 1958, p. 106-114. (Translation by Pergamon Institute.)

Previously abstracted from original. See item 1058-Q, 1957. (Q3; Al, Cu, 4-51)

1035-Q. Mechanism of Plastic Deformation, and Mechanical Properties, of Aluminum. Pt. 1. Study of the Mechanism of Plastic Deformation of Aluminum by Marks Arising on Its Surface During Extension. E. A. Iakovleva. *Physics of Metals and Metallography,* v. 4, no. 1, 1957, p. 115-120. (Translation by Pergamon Institute.)

Mechanism of plastic deformation of Al changes with the varying conditions of straining. Increase of temperature and decrease of speed of test influence the mechanism of deformation in the same direction. Making use of a wide range of speeds of elongation made it possible to follow the transition from the displacement to the atomic diffusion mechanism of deformation at one and the same temperature, roughly 250° C. 9 ref. (Q24; Al)

1036-Q. Mechanism of Plastic Deformation and of the Mechanical Properties of Aluminum. Pt. 2. Formation of Blocks in the Grain of Aluminum During Plastic Deformation. E. S. Iakovleva. *Physics of Metals and Metallography,* v. 4, no. 1, 1957, p. 120-125. (Translation by Pergamon Institute.)

The size and degree of disoriented areas are unequal if the conditions of straining are different. At low temperatures these areas are weakly formed by disoriented blocks. The over-all angle of disorientation of the blocks at 2% elongation does not exceed 1°. With the increase of deformation the angle of disorientation increases and the block size decreases. 7 ref. (Q24; Al)

1037-Q. One Method of Determining Fracture Strength. L. M. Kachanov and A. L. Nemchinskii. *Physics of Metals and Metallography,* v. 4, no. 1, 1957, p. 125-132. (Translation by Pergamon Institute.)

Fracture strength of low-carbon steel depends essentially on the small degree of deformation before rupture. If the stressed condition is reinforced somewhat so that the deformation before rupture is, for example, 0.1% of the length, then the fracture strength of low-carbon steel with grain no. 2 is 1.5 times greater than the value established by testing the usual smooth fractured surfaces in nitrogen. 7 ref. (Q26r; CN-g)

1038-Q. Deformation Texture of Cold Rolling in Low-Carbon Steel. K. V. Grigorov and G. P. Blokhin. *Physics of Metals and Metallography,* v. 4, no. 1, 1957, p. 133-139. (Translation by Pergamon Institute.)

Previously abstracted from original. See item 1060-Q, 1957. (Q24, M26c; CN-g)

1039-Q. Variation in Plasticity of Transformer Steel in the Process of Cooling. S. I. Doroshek, N. I. Lapkin and G. N. Shubin. *Physics of Metals and Metallography,* v. 4, no. 1, 1957, p. 140-143. (Translation by Pergamon Institute.)

Previously abstracted from original. See item 1061-Q, 1957. (Q23p, J23; ST, SGA-n)

1040-Q. (Bulgarian.) **Some Problems in the Technology of Producing Articles in Hadfield Manganese Steel.** Y. L. Dimitrov. *Tezhka Promishlennost,* v. 5, no. 12, 1956, p. 52-58.

Effects of chemical composition, production technology and heat treatment conditions on mechanical properties. The Mn:C ratio should be greater than 10, otherwise there will be a considerable amount of carbides in the steel. Reduction of carbon to 1% and lower impairs wear resistance. The optimum Si content is 0.6-0.5%. The cause of hot tearing and cold cracking is insufficient deoxidation. Homogenization at 1065° C. dissolves the carbides in solid solution. Heat treatment is best done in gas-fired holding furnaces. (Q-general, 2-60. 2-64; AY, *Mn,* SGA-m)

1041-Q. (Czech.) **Temperature Regulation During Long-Time Creep Testing.** B. Sestak. *Hutnicke Listy,* v. 12, no. 3, 1957, p. 202-206.

Review of existing thermo-regulators used for creep testing and two now types of dilatometric thermo-regulators for resistance furnaces and the necessary equipment. The proposed design has given completely satisfactory results (±1° C. temperature variation up to 700° C.). (Q3, X9, 1-53)

1042-Q.* (German.) **Tests on the Penetration Hardness and Grinding Hardness of Hard Metals.** P. Grodzinski. *Werkstattstechnik und Maschinenbau,* v. 48, July 1958, p. 364-372.

Tests performed with double-cone shaped penetration diamonds on hard materials such as diamonds, silicon carbide and different kinds of corundum, and tests with double-cone grinding stones of different materials on diamonds, silicon carbides, synthetic corundum and hard metals. Applicabilities of the method to ceramics, glazes, glass, hardened steel, pencil leads, abrasive disks, lubricants. (Q29c, 1-54)

1043-Q. (Polish.) **Preparation of Specimens and Tension Tests.** B. Otta and J. Teindl. *Hutnik,* v. 7, no. 1, 1957, p. 14-15.

Effects of filing and necking during a tension test on the elongation and tensile strength of metallic specimens. In cutting out a specimen for test, there is strain hardening at the point of cutting, so that the test yields an enhanced strength figure. Unfiled specimens have a tensile strength which is 6.6% higher than that of unfiled ones. Elongation can only be accurately determined when the tension test specimen fails in the middle. It was found that even a slight contraction greatly reduces elongation in tension tests. (Q27, 1-60)

1044-Q. (Polish.) **Hydrogen Corrosion of Steel and Procedures for Its Prevention (Hydrogen Brittleness of Steel).** Zabik Wladyslaw. *Przeglad Mechaniky,* v. 16, no. 2, 1957, p. 58-64.

Temperature has the greatest effect on diffusion of H and H embrittlement. Examples of embrittlement during acid pickling of Fe. Effect of composition of the scale on rate of evolution of H; effect of carbon content of the steel. Alloying of steel with Si, Cu and Ni does not increase its resistance to embrittlement; Mn, Mo and W have little effect, whereas Cr, V, Ta, Nb and especially Ti are effective. (Q26s, 2-60, 2-61; AY, *H*)

1045-Q. (Russian.) **Diagram of Composition Versus Refractoriness of Alloys of the Ternary System Nickel-Chromium-Titanium.** I. I. Kornilov and L. I. Pryakhina. *Izvestiya Akademii Nauk Otdelenie Tekhnicheskii Nauk,* no. 7, 1956, p. 103-110.

Hardness, electric resistivity, microstructure and refractory properties of the system Ni-Cr-Ti with constant Cr content (10% and 20%) and variable Ti content (from 0 to 15%). (Q29n, Q-general, 2-62; P15g, 2-60; Ni, Cr, Ti)

1046-Q. (Russian.) **Relation Between Composition, Temperature and Heat (Creep) Resistance. Pt. 3. Alloys of the Nickel-Chromium-Tungsten-Aluminum-Titanium System.** I. I. Kornilov and F. M. Titov. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk,* no. 10, 1956, p. 117-122.

Effect of Ti on the creep resist-

ance between 600 and 1250° C. of nickel alloys with 20% Cr, 6% W, 4.5% Al; Ti content was changed from 0 to 10% by replacement of Ni. Solubility of Ti in the alloy solid solution was studied between 850 and 1180° C. by metallography, from the change in hardness during aging for 450 hr. at 850-950 and 1000° C. and by measurement of the lattice constant of the solid solution, and was found to be 4.5% at 1180° C., 1.5-2% at 1000-1100° C., and less than 1% at 800-900° C. and below.
(Q3m, 2-60; Ni-b, *Cr, W, Al, Ti*)

1047-Q. (Russian.) **Effect of Heat Treatment on Notch Sensitivity of Chromium-Molybdenum Steel.** Z. N. Petropavlovskaya. *Metallovedenie i Obrabotka Metallov,* July 1958, p. 54-58. (Henry Brutcher, Altadena, Calif., Translation no. 4287.)

Heat treatment was shown to have special effect on notch sensitivity of Cr-Mo steel during tensile strength tests. By modifying heat treatment conditions the notch sensitivity and brittleness of this steel can be altered. For steels with composition of 1.5-2.5% Cr; 0.5-1% Mo and 0.2-0.5% V, it is recommended that a two-fold normalizing procedure take place, beginning at a high temperature (1040°), then a lowering to 960°, followed by annealing at 680°. 5 ref.
(Q23s, 2-64; AY, *Cr, Mo*)

1048-Q. (Russian.) **Effect of Temperature on the Shape of the Composition Versus Heat Resistance Curve.** M. V. Zakharov. *Sbornik Nauchnykh Trudov Moskovskogo Instituta Tsvetnykh Metallov i Zolota,* no. 25, 1955, p. 315-324.

Thirty-three copper alloys, containing small amounts of 14 different admixtures were investigated. Composition versus heat resistance diagrams (or composition versus prolonged hardness) experience a principal change with increasing temperature.
(Q-general, 2-60, 2-62; Cu-b)

1049-Q. (Russian.) **Procedure for Drawing the Strength Curves for High-Strength Steels Under Conditions of General Nonuniform Compression.** M. L. Gorb. *Sbornik Trudov Instituta Stroitel'noi Mekhaniki, Akademiia Nauk USSR,* no. 22, 1956, p. 35-55.

New procedure for dealing with experimental research data by deriving relationships from which strength curves can be drawn according to data of an indicator curve on compression (stress-deformation), strength curves for the ring and friction conditions at the ends. From a comparison of the strength curves for different systems of heat treatment it was found that cold working of ShKh15 steel after tempering (in liquid O_2, 15 min.) raises its resistance to relatively low elasto-plastic deformation and considerably lowers its capacity for increasing in strength on extensive plastic deformation.
(Q27a, Q24; ST)

1050-Q. (Russian.) **Effect of Work Hardening Edge Samples of Cold Rolled Transformer Steel on Its Electromagnetic Characteristics.** A. I. Belyakov. *Stal',* no. 2, 1957, p. 185-187.

As a result of heavy cold rolling of transformer steel the edge strips acquire high hardness which lowers its electromagnetic characteristics. To remove work hardening, annealing at 750-850° C. is helpful, since this lowers the specific losses by 15-20% and increases its magnetic induction by 100-400 gauss. Before using such annealing only 28% of samples from sheets 0.50 mm. thick (steel E330) and about 70% of samples from sheets 0.35 mm. thick satisfied normal standards; as after annealing, the quantity of samples which satisfied the standard increased to 98% for sheets 0.50 mm. thick and to 100% for 0.35 mm. thickness.
(Q23a, P16, 2-64; ST, SGA-n)

1051-Q. (Russian.) **Causes of the Unsatisfactory Ductility of Iron-Chromium-Aluminum Resistance Alloys.** A. P. Boiarinova and S. I. Malov. *Stal',* v. 17, no. 3, p. 280.

Presence of a large amount of alumina in Fe-Cr-Al resistance alloys of the 1Kh25Yu5 and OKh25Yu5 types is one reason for their unsatisfactory ductility. Having high hardness (600 BHN) alumina inclusions in drawing can cut the comparatively soft parent alloy (217 BHN) so that there are frequent breaks when wire of these alloys is drawn. To lower the amount of alumina in such alloys 0.3-0.5% Ti or Zr is introduced. Nitrides formed by this treatment do not impair the ductility of the alloys in wiredrawing.
(Q23p, F28; Fe, Cr, Al)

1052-Q. (Russian.) **Study of Sheet Steel for Reservoir Tanks.** R. I. Duda, L. S. Livshits, V. D. Taran and A. S. Fal'kvich. *Stroitel'stvo Predpriyatii Neftyanoi Promyshlennosti,* no. 1, 1957, p. 13-16.

New method of testing steel to brittle destruction at low temperatures shows the high quality of steel MST. 3 of improved deoxidation and of low-alloy manganese steel. Other tests imitate the working of steel for tanks in the process of the deformation and breakdown caused by the rolls. Welded joints and areas around the joints in both steels have strength equal to that of the main body of the metal.
(Q27a, Q26s; ST, 4-53)

1053-Q. (Russian.) **Effect of Protective Coatings on the Fatigue Resistance of Steel 18 KhNVA.** G. V. Kurganov, A. S. Nikishov, L. P. Rink and N. I. Yartemskaya. *Tekhnologia Transportnogo Mashinostroenia,* no. 2, 1957, p. 29-32.

Chromium and phosphate coatings were tested at 450° C.; coatings of Zn, Cd, oxides and Sn at 250° C. Short trials to destruction and fatigue points were carried out at room and higher temperatures. Tinned test pieces show some loss of strength at 250° C. Electrolytic Cr plating of steel reduces its cyclical strength by 15-17%, both at room and higher temperatures.
(Q7a; AY, 8)

1054-Q. (Russian.) **Effect of Zirconium, Titanium and Aluminum on the "Pressure" Effect in Aluminum Alloys.** S. M. Voronov, V. M. Elagin and L. M. Gladshtein. *Trudy Moskovskogo Aviatsionnogo Tekhnologicheskogo Instituta,* no. 30, 1956, p. 36-59.

Pressure effect in an Al-Zr alloy, and the effects of Zr on the properties of the industrial alloy Avial (Al-Mg-Si); also effects of V and Ti. Seven alloys with 0.1-5% of Zr and V and five with 0.1-1.0% of Ti were prepared. Curves are plotted for the effects of Zr, V and Ti on the mechanical properties of Avial pressed, quenched from 490-530° C. and aged. It has been confirmed that the pressure effect can appear in Al alloys containing Zr, Ti and V, and that the pressure effect in Al-Zr alloys is due to the decomposition of a solid solution, formed in casting, during working the ingot.
(Q-general, 3-74, 2-60; Al-b, *Zr, Ti*)

1055-Q. (Russian.) **Effect of Small Amounts of Titanium and Vanadium on the Properties of Zinciferous Silumin.** G. I. Pogodin-Alekseev, N. A. Solov'ev and A. S. Broido. *Tsvetnye Metally,* no. 1, 1956, p. 66-72.

Presence of 0.1-0.2% Ti, V, Zr in Zn-containing silumin (Alpax) improves the mechanical properties and corrosion-resistance; alloy has good casting properties, and gives high resistance to impairment of its properties by long-period and cyclic heating. Effect of up to 0.7% Ti and V on the properties of Al-Zn-Si alloys containing up to 15% Si and 20% Zn. Metallographic study showed that up to 0.1% Ti and V refines the grain and increases the uniformity of eutectic distribution.
(Q-general, R-general, 2-60; Zn-b, *Ti, V, Zn*)

1056-Q. (Russian.) **Approximate Values for the Yield Point Rate Coefficient for Hot Worked Metals.** L. I. Perlin. *Tsvetnye Metally,* no. 8, 1956, p. 71-72.

To determine the rate coefficient which is a function of normal and tangential true stresses, use is made of the facts that the strain hardening of any metal is proportional to a fractional power of the strain; if hot working lasts long enough the tensile strength of the strain-hardened metal is about 2½ times that of the non-strain-hardened metal; recrystallization in which all lattice distortions are eliminated lasts up to 10 sec. A table of rate coefficients at the recrystallization temperature is given, with evaluations of the accuracy of analytical calculations of the working stresses. Calculated values of the yield points for repeated and continuous processes are reported. (Q23b)

1057-Q. (Russian.) **Determination of the Endurance of Steel Subjected to Repeated Tensile Shock.** L. T. Timoshuk. *Zavodskaya Laboratoriya,* v. 22, no. 12, 1956, p. 1487-1489.

To measure the force exerted on it during a tensile shock, the upper end of the specimen is allowed to act on a piezo-electric transducer, whose signal at the moment of shock is recorded by a cathode-ray oscillograph. Steels 50 and 40KhNMA were subjected to repeated equal high tensile shocks and to alternating high and weak shocks. Steels having similar static mechancial characteristics may differ strongly in their reaction to repeated tensile shocks; repeated application of unequal tensile shocks increases the endurance of steel above that observed for repeated applications of the same high tensile shock X which can be regarded as caused by a "conditioning" of the steel by the intermediate low-value tensile shocks. (Q6p, Q27a; ST)

1058-Q. (Russian.) **Method of Determining Mechanical Properties of Metals in Torsion.** N. G. Mikhailichenko. *Zavodskaya Laboratoriya,* v. 23, no. 1, 1957, p. 83-87.

(*) Articles Available Through Photocopy Service; See Coupon, p. 75.

It is possible to determine all the principal mechanical properties of metals directly from automatically recorded torsion curves with an electrical method of strain measurement. Determination of proportionality limit, yield point and shear strength, and also relative and true shear. The lower peak on the curve of torque against relative twist angle depends little on the shape of the specimen and is a very important practical characteristic of the strength properties of a material. (Q1, 1-54)

1059-Q. Damping of Vibrations in Joints of Machine Parts. D. N. Reshetov and Z. M. Levina. *Vestnik Mashinostroeniya,* v. 36, no. 12, 1956, p. 3-13. (Henry Brutcher, Altadena, Calif., Translation no. 4238.)

(Q8, X28m)

1060-Q. Analysis and Application of Certain Creep Criteria. I. A. Oding and V. S. Ivanova. *Vestnik Mashinostroeniya,* v. 35, no. 5, 1955, p. 62-66. (Henry Brutcher, Altadena, Calif., Translation no. 4211.)

Previously abstracted from original. See item 652-Q, 1955. (Q3; ST)

1061-Q. Creep Ductility Criterion for Metals. V. S. Ivanova. *Zavodskaya Laboratoriya,* v. 21, no. 2, 1955, p. 212-216. (Henry Brutcher, Altadena, Calif., Translation no. 4210.)

(Q3)

1062-Q. (Russian.) **Computation of Diagrams for the True Strain of Cold Worked Metals.** G. P. Zaitsev. *Fizika Metallov i Metallovedenie,* v. 5, no. 3, 1957, p. 484-492.

7 ref. (Q25n, 3-68)

1063-Q. (Russian.) **Strengthening of Carbon Steel Wire Produced From Patented Billets.** K. D. Potemkin. *Stal',* v. 18, July 1958, p. 654-659.

Formula for determining tensile strength of wire subjected to deformation. 6 ref.
(Q27a, 2-64; ST, 4-61)

1064-Q. (Book.) **Tentative Guide for Fatigue Testing and the Statistical Analysis of Fatigue Data.** 90 p. 1958. American Society for Testing Materials, Special Technical Publication, STP 9-A. 1916 Race St., Philadelphia 3, Pa. $3.75.

Definitions of statistical terms; purposes of fatigue tests; definitions of test procedures; selection of test specimens and analysis of fatigue data. (Q7, S12)

Corrosion

529-R.* (Italian.) **Investigation of the Anodic Behavior of Titanium. Pt. 1. Measurement of Anodic Voltages.** Bruna Rivolta. *Metallurgia Italiana,* v. 50, May 1958, p. 173-180.

Influence of current density and temperature on anodic behavior of Ti in 0.5 N solutions of HCl, NaCl, H_3BO_3, NH_2HSO_3, KOH, Na_2S, NaF and HClO4. For NaF solutions, influence of acidity was also studied by adding HF, HCl and H_2SO_4. In all cases, with exception of fluorhydric solutions, passivation of electrode and formation of protective films was noted. (To be continued.) 14 ref. (R6g, R10c; Ti)

530-R.* High Temperature Hydrogen Sulphide Corrosion in Commercial Sovaformer Units. Pt. 1. E. B. Backensto, R. D. Drew and J. N. Vlachos. *Corrosion Technology,* v. 5, Jan. 1958, p. 13-16, 21.

Hydrogen sulphide corrosion presents a problem in the Pt catalyst reforming which is used to produce the high-octane motor fuel. This corrosion can be minimized by the reduction of the hydrogen sulphide in the process stream, the use of Cr-Ni austenitic steels, and the protection of metals by aluminizing. 6 ref. (R9k, T29n; 2-62)

531-R.* Inhibition of the Corrosion of Aluminum in Alkaline Solutions. J. Sundararajan and T. L. Rama Char. *Corrosion Prevention and Control,* v. 5, May 1958, p. 55-56.

Corrosion rates of sheets of Al alloys containing Fe, Cu and silica immersed in 0.2 to 0.6 normal sodium hydroxide at 32 to 60° C. for periods of 1 to 5 hr. Inhibitor efficiencies of agar-agar, gum acaciae, dextrin, glue or gelatin at concentrations of 2 to 20 g. per l. Agar-agar or gum acaciae at 10 g. per l. gave inhibitor efficiencies in the range of 80 to 90. 9 ref.
(R10b, R6j, Al, *Cu, Fe, Si*)

532-R.* Platinum-Faced Titanium for Electrochemical Anodes. J. B. Cotton. *Platinum Metals Review,* v. 2, no. 2, Apr. 1958, p. 45-47.

Titanium is resistant to the passage of current into an electrolyte, but has low resistivity when a second metal makes contact with it. When Ti is used as an anode in salt water and an anodic current increased, the voltage required to force the current through the service film rises until, at the weakest point, the film breaks down and local corrosion ensues. If, however, a small piece of Pt foil or wire is spot welded to the Ti, most of the current passes out through the Pt and the Ti is uncorroded.
(R10d; Ti, Pt)

533-R. Effect of Porosity on the Corrosion Rate of Anodic Coatings. L. I. Kadaner and A. Kh. Masik. *Journal of Applied Chemistry of the USSR,* v. 30, 1957, p. 839-842. (Translation by Consultants Bureau, Inc.)

The rate of corrosion of anodic coatings in electrolytes depends to a significant extent on their porosity. Increase of the thickness of an anodic coating leads, on one hand, to an increase of the corrosion rate owing to increasing physical heterogeneity, and on the other, to a decrease of the corrosion rate owing to decreased porosity of the coating. The effect of layer thickness on the corrosion rate is determined by the relative significance of these factors. 5 ref.
(R-general, 8-78, 9-68)

534-R.* Corrosion of Cutlery. E. A. Oldfield and D. Sheppard. *Corrosion Technology,* v. 5, June 1958, p. 187-189.

Evaluation of quick acid test and prolonged 3% salt solution test for corrosion resistance of stainless steel. Compares laboratory test to results obtained for knives used under household conditions. Commonly used qualitative testing procedures; causes of low corrosion resistance, corrosion of packed cutlery and corrosion in service. 6 ref.
(R3, R4, R10e, R11; SS)

535-R. "Corrosion Keys": Lead. Carl Hack. *Chemical Processing,* v. 21, Aug. 1958, p. 123, 125, 127.

Behavior of Pb in corrosive environments. (R-general; Pb)

536-R. Highly Aggressive Solutions Can't Hurt Zirconium Castings. *Chemical Processing,* v. 21, Aug. 1958, p. 141-146.

Pump impellers, 50 diaphragm valves and other items withstand conditions about as severe as could be encountered anywhere in chemical processing, preventing contamination as well as corrosion.
(R-general, T29; Zr, 5-60)

537-R. Humidity Testing of Protective Finishes. H. Melrose and R. E. J. Shave. *Corrosion Prevention and Control,* v. 5, May 1958, p. 49-54.

Necessity for high degree of accuracy in control of temperature and relative humidity in achieving consistent condensation and reevaporation of moisture on specimens during accelerated corrosion testing. (R11k)

538-R. Boiler Corrosion and Its Alleviation by Feed Water Conditioning. Pt. 2. The Conditioning of Feed Water. Andrew Laird and N. Reast. *Corrosion Prevention and Control,* v. 5, May 1958, p. 57-62.

(R4c, R10a, T26q)

539-R. Plastic Coatings for Buried Pipes. W. D. Parker. *Corrosion Technology,* v. 5, June 1958, p. 179-180.

(R8, R10e; 4-60, NM-g33)

540-R. Relative Corrosion Resistance of Stainless Steels. *Welding Engineer,* v. 43, July 1958, p. 59.

(R-general; SS)

541-R. Corrosion Cracking of Brass Under the Action of a Cyanide Electrolyte. A. V. Shreider. *Journal of Applied Chemistry of the USSR,* v. 30, 1957, p. 836-838. (Translation by Consultants Bureau, Inc.)

Corrosion cracking of brass manifolds used for conveying liquid fuel.
(R1d, R6j; Cu-n)

542-R. (Czech.) **Corrosion of Silver Articles.** Karel Komarek. *Casopis Narodniho Musea,* no. 2, 1955, p. 136-141.

Physico-chemical properties of Ag and causes of its corrosion in air and in the soil, are considered. In the air Ag reacts with H_2S, in the presence of oxygen, to form Ag_2S. Corrosion of Ag in the soil consists in the formation, on its surface, of a film of AgCl by interaction with solutions of NaCl in the presence of CO_2 and O_2. Formation of AgCl in the soil is promoted by soluble salts of Fe^2 ions. The coating of Ag_2S is removed from the surface of the Ag with KCN by converting Ag_2S to the soluble complex salt $KAg(CN)_2$. (R3, R8; Ag)

543-R. (Russian.) **Corrosion Resistance of Aluminum and Copper.** V. I. Avdeveva, L. P. Povalyayeva and A. Ya. Shatalov. *Trudy Voronezhskogo Gosudarstvennogo Universitela,* no. 2, 1956, p. 79-80.

Rate of corrosion of pure Cu and Al in buffer solutions in the presence of 0-1.0 *N* Cl-ions, encompassing the pH range of 2-12. Cu showed minimum rate of corrosion at pH 10-11.0, depending upon Cl-ions; minimal rate of corrosion of Al was at a pH 7.0-7.5 irrespective of the Cl-ion content of the solution. (R4; Al-a, Cu-a)

544-R.* **Vapor Phase Corrosion Inhibitors. Pt. 2. Applications.** K. S. Rajagopalan. *Electrochemical Society, India Section, Bulletin,* v. 7, Apr. 1958, p. 37-43.

Mechanism of operation of vapor phase corrosion inhibitors; examples of applications in packaging. 17 ref. (R10b)

545-R. (Russian.) **Effect of Chromium and Antimony on the Corrosion of Wrought Iron.** I. M. Bokhovkin. *Trudy Arkhangilskovo Lesotekhnicheskovo Instituta,* v. 16, 1955, p. 56-62.

Corrosion of graphitized wrought iron alloyed with Cr and Sb in 1 *N* H_2SO_4 at 50° is greater than non-graphitized specimens. Maximum attack was observed by in iron containing 0.42% Sb, and is explained by the chemical reaction between Cr and Sb. In the absence of passivation the rate of corrosion is determined by the interatomic bonds in alloys.
(R6g, 2-60; Fe-m, *Cr, Sb*)

546-R.* **The Use of Magnesium for the External Cathodic Protection of Marine Vessels.** C. F. Schrieber. *Corrosion,* v. 14, Mar. 1958, p. 26-30.

Over-all hull, including stern area, may be protected by a distributed system of Mg anodes. Anode weight, optimum length and number of anode strings are related to anode life. Cost of cathodic protection on ships and maintenance cost for unprotected ships compared. 7 ref. (R4b, R10d; Mg)

547-R.* **Prevention of Localized Corrosion in Sulfuric Acid Handling Equipment.** G. A. Nelson. *Corrosion,* v. 14, Mar. 1958, p. 45-49.

Localized corrosion, usually deep grooves, is due to differences in carbide structure created during welding or hot riveting operations. Preventive measures include removing the objectionable zones by a normalizing heat treatment, preventing objectionable phases from forming, or covering the areas with other corrosion resistant materials.
(R6g, R10, T29m)

548-R.* **Stress Corrosion of Austenitic Stainless Steel in Geothermal Steam.** T. Marshall. *Corrosion,* v. 14, Mar. 1958, p. 59-62.

Geothermal steam contaminated with chlorides, hydrogen sulfide and carbon dioxide was used. Stress-corrosion cracking occurred readily in the aerated, superheated steam but not when air-free. Tests prove that the cathodic depolarizing action of oxygen is essential to the stress-corrosion mechanism. Five conditions must be satisfied simultaneously to have cracking of austenitic stainless steel by geothermal steam; therefore, failure to satisfy any one of these conditions will prevent attack. 20 ref.
(R4d, R1d; SS-e)

549-R.* (Czech.) **Oxidation of Fe-Al-C Alloys.** Miloslav Vkylicky, Bohumil Prenosil and Hanus Tuma. *Hutnicke Listy,* v. 13, 1958, p. 490-495.

Study of alloys with varying Al and C content in the range of 900 to 1050° C. In some alloys oxidation is characterized by formation of blisters resulting from warping of initial protective layer. Oxidation continued at greater rate on spot of blister formation. Metallographic examination indicated that warping of initial protective layer is caused by volume changes connected with transformation of epsilon phase to gamma phase. This transformation was conditioned during oxidation by reduction of Al content in the base material in proximity to the surface. 16 ref. (R1h; Fe, Al, C)

550-R. (Russian.) **Kinetics of Etching of Zinc Used in Printing by the Chemical Method.** A. N. Krestovnikov and S. S. Gastev. *Nauchneye Trudy Moskovskoe Poligraficheskogo Instituta,* no. 3, 1955, p. 135-142.

Rate of dissolution of sheet Zn used in the printing industry, in mixtures of HCl and HNO_3 (using 15, 10 and 5% by weight of each component in the mixture), by determination of loss in weight after 5 min. of etching. (R7b; Zn, 4-53)

551-R.* **Corrosion and Protection of Galvanized Steel Transmission Tower Footings.** J. D. Piper. *Corrosion,* v. 14, Mar. 1958, p. 19-25.

Although the potentials vary with the seasons, the condition of galvanized tower footings may be predicted by means of electrical potential measurements. While corrosion occurs near the water table on towers having footings in permanent moisture, serious corrosion occurred only on footings having a metallic connection to electropositive structures or having a direct contact with cinders and other coal products. Magnesium anodes provide protection for galvanized tower footings. 5 ref.
(R8, R10d, T26; ST, 8-65)

552-R.* **A Reaction Rate Study of the Corrosion of Low-Hafnium Zirconium in Aqueous Hydrofluoric Acid Solutions.** Tennyson Smith and George Richard Hill. *Electrochemical Society, Journal,* v. 105, Mar. 1958, p. 117-121.

Zirconium dissolves readily in HF solutions leaving a smooth unpitted surface. The rate of dissolution is directly proportional to the ununionized HF concentration when studied over a temperature range of −78° C. using a radioactive tracer Zr^{95}. 9 ref. (R6g; Zr-b)

553-R.* **Dissolution of Metals in Aqueous Acid Solutions. Pt. 2. Depolarized Dissolution of Mild Steel.** A. C. Makrides and N. Hackerman. *Electrochemical Society, Journal,* v. 105, Mar. 1958, p. 156-162.

Dissolution rates of mild steel cylinders rotated in 2*N* HCL solutions containing ferric chloride, benzoquinone, and tolu-p-quinone. Dependence of rate on depolarizer concentration, stirring velocity, temperature and surface roughness of the metal. At high velocities the dissolution rate depends linearly on velocity of rotation and on the roughness of the metal surface. 22 ref. (R6g; CN)

554-R.* (French.) **Contribution to the Study of the Corrosion Mechanism of Magnesium and One of Its Alloys.** Guy Gronoel. *Comptes Rendus,* v. 246, May 12, 1958, p. 2750-2753.

Study of pH-potential curves of electrodes of high-purity Mg and of Ga_3Zr immersed in solutions of hydrochloric acid. Tests were conducted to determine effect of initial concentration of solutions at temperatures ranging from 20 to 50° C., both in presence of air and in nitrogen atmosphere. Comparative measurements were made in absence of agitation and after violent agitation of solutions, particularly in area contiguous to electrode. Films formed were studied by micrographic and radiocrystallographic means. (R6g, 2-66; Mg)

555-R. **Effect of Cathodic and Anodic Polarization on the Rate of Corrosion Cracking in Stainless Steel.** V. V. Romanov and V. V. Dobrolyubov. *Metallovedenie i Obrabotka Metallov,* July 1958, p. 19-21. (Henry Brutcher, Altadena, Calif., Translation no. 4277.)

Cathodic polarization retards and can fully stop corrosion cracking. Anodic polarization, on the other hand, speeds the process. Polarization has an effect on the character of corrosion cracks, on their shape and form of development. Increase in temperature raises the strength of the protective cathodic current, while the acceleration of the influence of anodic polarization was attained under much lower temperatures. 7 ref. (R1d, 2-61; SS)

556-R. **Selective Oxidation Due to the Heating of the Evaporated Film of Alpha-Brass.** N. Takahashi and K. Mihama. *Electron Microscopy, Proceedings of the Stockholm Conference,* Sept. 1956, p. 322-324.

A single crystal of alpha-brass is subjected to oxidation. Formation, crystal structure of CuO and ZnO studied. 8 ref.
(R1h; M21e, Cu-n, 14-61)

557-R. **Corrosion Preventive Additives. Armour Research Foundation.** (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131459, Mar. 1952, 120 p. **$3.**

New corrosion inhibitors to supplement or replace petroleum sulphonates as lubricant additives.
(R10b, NM-h)

558-R.* **Corrosion Rates in Port Hueneme Harbor.** Carl V. Brouillette. *Corrosion,* v. 14, Aug. 1958, p. 352t-356t.

Sixteen metals and alloys were immersed for 30 months in the sea water at Port Hueneme, Calif. Lead was least, while Mg alloys were most readily attacked. Pitting was major factor in corrosion of Al, stainless steel and Monel.
(R2j, R4b, 2-60; Al-b, Cu, Ni, Pb, CN-g, SS-c)

559-R.* **Corrosion Problems in the Manufacture of Phosphoric Acid From Elemental Phosphorus.** J. C. Barber. *Corrosion,* v. 14, Aug. 1958, p. 357t-362t.

Material used in construction of equipment. Corrosion rates for Type 316 stainless steel exposed to phosphoric acid at different temperatures. Relative corrosion resistance of 11 other alloys compared to Type 316. 18 ref.
(R6g, T29m, 17-57, 2-61; SS)

560-R.* **Weather Versus Cathodic Protection of Underground Pipe Lines.** F. E. Costanzo. *Corrosion,* v. 14, Aug. 1958, p. 363t-368t.

Comparison between weather data and cathodic protection survey data of a four-mile section of a 20-in. bare pipe line in southwestern Pennsylvania over a period of five years. Relationship between rectifier current output and rainfall, soil temperature and mean daily temperature. Temperature has little effect while precipitation of more than ½ in. makes definite change in cathodic protection current requirement. 6 ref. (R10d, T26r; ST)

561-R.* **The Present Status of the Oil Ash Corrosion Problem.** *Corrosion,* v. 14, Aug. 1958, p. 369t-372t.

Five case histories involving failures in the field are reviewed. Proposed solutions include the use of inhibitors, changing alloy composi-

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

tion, lowering operating temperature and altering composition of the oil. 17 ref. (R6p, R7d; Cr, Fe, Ni)

562-R.* Zinc as a Cathodic Inhibitor. Hans B. Jonassen. *Corrosion*, v. 14, Aug. 1958, p. 375t-376t.

Zinc in close contact with Ag furnishes Zn ions to an aqueous solution. A binuclear Zn hydroxide cation seems to be formed which can act as a cathodic inhibitor. This ion also acts as a buffer removing CO_2 and it reacts with oxygen put in the water to give additional hydroxide ions. 11 ref. (R10d; R4, Fe, Zn)

563-R.* An Eddy Current Gauge for Measuring Aluminum Corrosion. W. E. Ruther. *Corrosion*, v. 14, Aug. 1958, p. 387t-388t.

Alternating current bridge measurement of impedance of a coil containing a corroded Al specimen may be directly converted to average metal loss per sq.cm. Results of dynamic aqueous corrosion tests at 260° C. using this method. 6 ref. (R11h, R4, X1c; Al-b)

564-R.* Observations on Corrosion Resistance of High Strength Stainless Steels for Aircraft. John Halbig and O. B. Ellis. *Corrosion*, v. 14, Aug. 1958, p. 389t-395t.

Corrosion rate of Types 431, 17-PH, 17-7 PH, PH 15-7 Mo and Type 304 stainless steels in various heat treated conditions in sulphuric acid, hydrochloric acid, nitric acid, formic acid, acetic acid, phosphoric acid or sodium hydroxide of varying concentrations and at different temperatures. Resistance of precipitation hardening stainless alloys to sea water, high-purity water, stress-cracking and galvanic corrosion. Effects of nitriding, welding or brazing on corrosion resistance. Resistance of precipitation hardening and hardenable stainless steels to corrosion by industrial and marine atmospheres. 26 ref. (R-general; 2-61, 2-64, 2-66; SS)

565-R.* (German.) **Corrosion Resistance of Anodized Coatings Suffering From Hairline Cracks.** H. Neunzig. *Aluminium*, v. 34, July 1958, p. 390-391.

Influence of electrolyte temperature on susceptibility of bright anodized coating 5-15 microns thick to hot cracking and corrosion. High-purity Al-Mg alloy sheet anodized at 17 and 25° C. and then exposed to temperatures above 100° C. 15-micron coatings developed clearly visible hairline cracks which were susceptible to corrosion. High electrolyte temperature increased rate of corrosion when hairline cracks formed. (R2g, L19, 2-61, 9-72; Al-b)

566-R.* (German.) **Experiences With Light Metal Products in the Tropics.** M. Rauschert. *Aluminium*, v. 34, July 1958, p. 406-409.

Experiences with Al equipment on two expeditions into Amazon regions. Trunks, special containers, cans, Al foil, cartridge cases and protective covers of Al showed good corrosion resistance. (R3s, T6, T10; Al-b)

567-R. (Russian.) **Some Data Concerning the Resistance to Intercrystalline Corrosion of Pure-Austenite Steels Containing 23% Chromium and 23-28% Nickel.** Yu. I. Kazennov and L. P. Kolosova. *Avtomaticheskaya Svarka*, no. 2, 1957, p. 11-21.

Effects of heating, during welding, on resistance to intercrystalline corrosion of steels containing 0.06-0.09% C. (R2h, K9n; SS, 7-51)

568-R. (Russian.) **Corrosion of Cylinders of Automotive Engines.** B. B. Genbom. *Avtomobil'naya i Traktornaya Promyshlennost*, no. 5, 1956, p. 18-23.

Cylinder corrosion is essentially of electrochemical nature. One of the principal causes of uneven wear of the cylinders is the uneven temperature distribution over their inner surface. The rate of wear of any given area increases with lowering of its temperature during operation. (R1a, Q9n, T21b)

569-R. (Russian.) **Protective Potentials of Metals.** V. V. Gerasimov. *Izvestiya Akademii Nauk SSR, Otdelenie Khimicheskikh Nauk*, no. 3, 1957, p. 263-269.

Method of calculating protective potentials is based on the assumption of the existence of an exponential correlation between rate of corrosion of the metal and its potential (on the condition that ionization of the metal constitutes the controlling stage of the process). (R1a)

570-R. (Russian.) **Corrosion Resistance of Aluminum and Copper.** V. I. Avdeyeva, L. P. Povalyayeva and A. Ya. Shatalov. *Trudy Voronezhskogo Universiteta*, no. 2, 1956, p. 79-80.

Rate of corrosion of pure Cu and Al in buffer solutions in the presence of different additions of 0-1.0 *N* Cl ions, encompassing the pH range of 2-12. Cu showed minimum corrosion rate at pH 10-11.0, depending upon Cl ions; minimum rate for Al was at pH 7.0-7.5 irrespective of the Cl ion content of the solution. (R6; Al, Cu)

571-R. (Russian.) **Investigation of Corrosion Resistance of Solid Solutions of Metals. Pt. 1. The System In-Pb.** N. N. Gratsianskiy and M. L. Kaplan. *Zhurnal Fizika Khimii*, no. 3, 1956, p. 651-659.

Rate of corrosion, steady-state potential and microhardness of solid solutions of the In-Pb system in the range 0-100 at. %. Corrosive media used: 1% H_2SO_4 1% citric acid at 16 and 50° C. (R6g; In, Pb, 14-67)

572-R. An Investigation of Intergranular Oxidation in Stainless Steels and High-Nickel Alloys. C. A. Siebert, M. N. Sinnott, L. H. DeSmyter and R. E. Keith. University of Michigan. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 131471, June 1955, 108 p. $2.75.

Grain-boundary oxidation of chromel alloys ASM, ARM and D, and Type 310 stainless steels in the range of 1600 to 2000° F. These alloys and Inconel were oxidized for 100-hr. periods in the stressed condition and up to 500 hr. in the unstressed condition; intergranular measurements were obtained microscopically. Stress caused an increase in intergranular penetration when a minimum stress was reached. In general, the intergranular penetration increased with increasing time and temperature. A plot of the square of the specific weight gain vs. temperature resulted in a straight-line relationship. (R1h, R2h; SS, Ni)

573-R. (Russian.) **Corrosion Characteristics of Welded Seams of Stainless Steels in Oxidizing Solutions.** B. I. Medobar, N. A. Langer and M. M. Kurtepov. *Avtomaticheskaya Svarka*, no. 2, 1957, p. 57-60.

Tests in boiling 15% HNO_3 (I), 55% HNO_3 (II) and 15% solution of HNO_3 + 10% $K_2Cr_2O_7$ (III), have shown that in I all the seams tested are stable, in II the rate of corrosion is 100-200 times higher. In III a sharp acceleration in corrosion takes place. (R6g; SS, 7-51)

574-R. (Russian.) **Passivity of Steel in Nitrose.** Ye. I. Litvinova. *Zhurnal Prikladnoi Khimii*, no. 10, 1956, p. 1521-1529.

Study of passivation of steel in hot nitrose acid containing 1-10% HNO_3 and 75-76% H_2SO_4. The steel undergoes strong corrosion with extensive evolution of gas, but as a result of passivation this process suddenly ceases. The greater the initial rate of corrosion, the shorter is the time until passivation results. At optimal pass:vation temperature of 100° a protective layer is formed about 3 microns thick, consisting of $Fe_2(SO_4)_3$. (R10c, R6g; ST)

575-R. HRP Radiation Corrosion Studies: In-Pile Loop L-4-11. J. R. McWherter and J. E. Baker. *U. S. Atomic Energy Commission, ORNL-2152*, 1958, 48 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.50.

Corrosion studies of Zr and Ti alloys and stainless steels, as well as specimens of synthetic sapphire, sintered alumina, Pt and Incoloy. Zr alloys Zr-3 (3% Ag), Zr-3 (0.52% Sn, 5.71% Ti, 40 ppm. N_2), Zr-3 (0.52% Sn, 0.28% Fe, 5.66% Ti, 60 ppm. N_2), Zr-3 (1.4% Fe) and Zr-4 (0.7% Fe, 2.8% Cr) corroded at rates about two or three times those observed for Zircaloy-2 at the same power density. Corrosion rates for Incoloy were found to be about the same as those for stainless steel exposed to similar conditions. (R-general, T11; Zr-b)

576-R. (Czech.) **Corrosion of Silver Articles.** Karel Komarek. *Casopis Narodniho Musea, Oddeleni Prirodoved*, v. 124, no. 2, 1955, p. 136-141.

Physico-chemical properties of Ag and causes of its corrosion in air and in the soil. (R-general; Ag)

577-R. (Russian.) **Corrosion of Steel in the System Nitric Acid-Acetic Acid.** A. V. Titov. *Trudy Ivanovskogo Khimiko-Tekhnologi-Cheskogo Instituta*, no. 5, 1956, p. 80-81.

Maximum rate of corrosion is observed in the pure acids, and a minimum rate in a mixture of acids containing 42% by volume of HNO_3. (R6g; ST)

578-R. (Russian.) **Supplementary Uses of a Type of Special Cast Iron.** Tyshko. *Prace Instytut Odlewn*, v. 6, no. 1-2, 1956, p. 10-21.

Cast iron with 5-8% Si is noted for its heat resistance. At around 900° it withstands oxidation well, but has significantly lower resistance to alkalies and salts. Addition of small amounts of Mo (2-4%) improves resistance to HCl and related chemical products. Aluminum cast iron is comparatively cheap and naturally suitable for production of lightly loaded articles working at high temperatures. High Cr cast iron also possesses good wear

resisting qualities and is used for mill-roll facers, for the production of brakeblocks and parts of pumps. (R1h, R6, Q9n, 17-57; CI-q)

579-R. (German.) **Investigation of Thermoelectric Wear of Hard Metal Turning Tools and Its Elimination by Electrical Compensation.** Theodor Hehenkamp. *Archiv für das Eisenhüttenwesen,* v. 29, Apr. 1958, p. 249-256.

Thermoelectric currents resulting from contact at different temperatures between tool and production part cause wear by transfer of matter. 17 ref.
(R2a, Q9, G17a, T6n; Ti, Ta, W, 6-69)

S Inspection and Control

559-S.* (French.) **Device for Easy Measurement of Air Feed to the Cupola.** Andre Mal. *Fonderie Belge,* v. 28, June 1958, p. 187-189.

Inexpensive mechanism consisting of diaphragm and differential manometer mounted on blower piping; operating formulas. (S18q, W18d)

560-S.* **Fluoroscopy Is Ready for New Jobs.** W. R. Hampe. Digest of talk presented before Society of Nondestructive Testing, Dallas, May 1958. *Metal Progress,* July 1958, p. 130, 132, 134.

Fluoroscopy is particularly successful in locating linear discontinuities—tears or cracks (hot or cold). Shrinkage may be seen readily if it is of the cavity type or of the coarse sponge variety. Micro-shrinkage is difficult to see. Three basic fluoroscopic geometric arrangements are used—conventional, high brightness and high definition. Techniques outlined.
(S13e)

561-S.* (French.) **Surface Roughness After Grinding and Polishing.** Abbe Cavere. *Machine Moderne,* v. 52, June 1958, p. 33-37.

Conventional visual and mathematical procedures for evaluating surface roughness were found inadequate for hand ground and polished welded iron pipe joints. New approach is proposed in which roughness is viewed as factor which increases wetted surface. Coefficient of increase of wetted surface, obtained by relating normal length of given area to sum of measurements of saw-tooth profile of machined surface, becomes criterion of comparison with required standard.
(S15)

562-S.* (Portuguese.) **Nondestructive Testing With Ultrasonic Techniques. Pt. 1.** L. X. Nepomuceno. *Engenharia, Mineracao e Metalurgia,* v. 27, May 1958, p. 273-277.

Physical aspects of phenomenon of vibration; geometrical acoustics; principles of ultrasonic examination; testing by means of pulsed ultrasonics. (To be continued.) (S13g)

563-S. **Research on a Method for Determining Boron in Low-Boron Steels.** C. T. Litsey, D. L. Chase and E. J. Center. Battelle Memorial Institute. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131374, June 1957, 16 p. $.50.

Accuracy of about 5-10% at the 50 parts per million boron level.
(S11a; AY, *B*)

564-S. **Gravimetric Determination of Bismuth Using Hypophosphorous Acid.** Donald R. Bomberger. *Analytical Chemistry,* v. 30, Aug. 1958, p. 1321-1322.

4 ref. (S11b; Bi)

565-S. **Determination of Traces of Boron in Nickel.** C. L. Luke. *Analytical Chemistry,* v. 30, Aug. 1958, p. 1405-1406.

4 ref. (S11a; Ni, B)

566-S. **Photometric Determination of Traces of Boron in Silicon.** C. L. Luke and S. S. Flaschen. *Analytical Chemistry,* v. 30, Aug. 1958, p. 1406-1409.

After separation by a hydrothermal refining technique. 7 ref.
(S11a; Si, B)

567-S. **Determination of Calcium in Wolframite Ore.** James E. Mathers, G. Victor Potter and Nelson W. Shearer. *Analytical Chemistry,* v. 30, Aug. 1958, p. 1412-1413.

(S11; RM-n, Ca, W)

568-S. **Problems Involved in Analyzing Iron Ore Sinters.** J. Alfred Gerger and Samuel H. Klinvex. *Blast Furnace and Steel Plant,* v. 46, July 1958, p. 698-704.

Study of reproducibility of chemical analyses made on blast furnace sinter by various laboratories. Constituents analyzed include total iron, FeO, P, S, Mn, silica, magnesia, C, alumina. 6 ref. (S11; Fe)

569-S. **Measuring Width in a Hot Strip Mill. Servo-Driven Optical Device Uses Infra-Red Radiation.** *Metallurgia,* v. 57, June 1958, p. 307-308.

(S14d, F23; ST, 4-53)

570-S. **The Determination of Tin and Tin-Iron Alloy Weights on Tinplate Using the Kunze-Willey Method.** F. Cooke and C. E. A. Shanahan. *Metallurgia,* v. 57, June 1958, p. 321-326.

Coulometric method compares satisfactorily with values obtained using chemical dissolution and weight loss method. (S11m; Sn, Fe)

571-S. **Metallurgical Absorptiometry and Spectrophotometry. Pt. 1.** E. C. Pigott. *Murex Limited Review,* v. 1, no. 18, 1958, p. 528-540.

Photo - electric absorptiometers; available instruments and their application. 4 ref. (S11a, 1-53)

572-S. **Sampling of Molten Steel for Oxygen Determination.** William M. Milton. *Royal College of Science and Technology, Metallurgical Club, Journal,* no. 10, 1957-1958, p. 24-27.

7 ref. (S11r, S12h; ST, *O*, 14-60)

573-S. **Potentiometric Micro-Titration of Manganese in Ferrous and Nonferrous Metals and Alloys in Ores, Rocks, and Other Materials.** A. S. Slavatinsky. *Journal of Analytical Chemistry of the USSR,* v. 12, 1957, p. 503-506. (Translation by Consultants Bureau, Inc.)

11 ref. (S11j; Mn, RM-h, RM-n)

574-S. **Photometric Determination of Boron in Steel.** I. U. Martynenko and A. M. Bondarenko. *Journal of Analytical Chemistry of the USSR,* v. 12, 1957, p. 513-516. (Translation by Consultants Bureau, Inc.)

19 ref. (S11a; ST, B)

575-S. (German.) **Czechoslovakian Research on the Isolation of Nonmetallic Inclusions and Carbides in Steels.** M. Sicha. *Freiberger Forschungshefte,* B26, 1958, p. 46-61.

Old and new methods with emphasis on electrolytic procedure. 23 ref. (S11; ST, 14-68, 9-69)

576-S. (German.) **"Surface Play" of Molten Cast Iron.** Gyula Nandori. *Freiberger Forschungshefte,* B25, 1958, p. 70-76.

Estimating the composition (Si and Mn in particular) of molten iron from surface appearance. 12 ref.
(S11; CI, *Mn, Si,* 14-60)

577-S. (German.) **Some Modern Apparatus for Continuous Material Testing.** Louis Beaujard and Vladimir Husarek. *Schweisstechnik,* v. 12, Apr. 1958, p. 39-43.

New ultrasonic and magnetic test methods used on sheets. (S13; 4-53)

578-S. (German.) **How to Indicate the Roughness of Surfaces.** R. Kretschmer. *Werkstattstechnik und Maschinenbau,* v. 48, June 1958, p. 321-323.

15 ref. (S15)

579-S. **Determining C, P and S in Steel. Use of Hilger Fluorite Polychromator.** *Iron and Steel,* v. 31, Mar. 1958, p. 101-102.

(S11a; *C, S, P,* ST)

580-S. **Thermoelectric Method of Determining Carbon in Steel During Openhearth Heats.** P. D. Korzh and A. P. Ershova. *Zavodskaya Laboratoriya,* v. 24, 1958, p. 41-43. (Henry Brutcher, Altadena, Calif., Translation no. 4265.)

Previously abstracted from original. See item 245-S, 1958.
(S16j; ST, *C*)

581-S. (German.) **Analysis of Residues in Low Carbon Steel Treated With Special Deoxidizing Agents.** T. Malkiewicz and J. Foryst. *Freiberger Forschungshefte,* B26, 1958, p. 37-45.

Electrolytic analysis of residues. 12 ref. (S11g; CN)

582-S. (German.) **Spectroscopic Analysis of Metals, Alloys and Ores.** W. Nabholz. *Schweizerische Technische Zeitschrift,* v. 55, June 19, 1958, p. 509-518.

(S11k)

583-S. (Russian.) **Magnetic Inspection of Rails.** V. V. Vlasov. *Fizika Metallov i Metallovedenie,* v. 5, no. 5, 1957, p. 442-451.

63 ref. (S13h, T23q)

584-S.* (Chinese.) **Detection of Iron in Tungsten-Cobalt Alloys.** L. Yu. Chen. *Acta Chimica Sinica,* v. 24, June 1958, p. 205-209.

Fe is separated by paper chromatographic method and extracted with 0.1 *N* HCl, and finally determined by Unican photo-electric colorimeter. (S11a; Co, Fe, W)

585-S.* (German.) **Optical Inspection; Present Status and Prerequisites for Automation.** H. Schier. *Werkstattstechnik und Maschinenbau,* v. 48, June 1958, p. 315-320.

Photo-electric testing method compared with exposure of pictures in a television studio. The "flying spot" system is suggested as well as the use of several receivers the impulses of which are made visible on one screen. Optical equipment and the electronic system of the testing apparatus. 9 ref.
(S13d, 1-53)

586-S.* (Italian.) **Defects in Aluminum Alloy Parts Made Fom Semi-finished Products and Specific Methods of Inspection.** Eugenio Hugony. *Ingegneria Meccanica,* v. 7, Apr. 1958, p. 25-33.

Defects may originate in foundry procedures, be caused by overheating in heat treat or hot working operations or by finishing operations. Inspection methods and standards. Case histories of defective parts. (S13)

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

587-S. Simple Analytical Control for Small Foundries. W. A. Burford. *British Foundryman,* v. 51, June 1958, p. 280-282.

Rapid uncomplicated method for determining Sn, Pb, Zn, Ni and P in Cu alloys. Method based on use of centrifuge to obtain various precipitates is accurate enough for most foundry purposes.
(S11g; Cu-b, P, Pb, Sn, Zn)

588-S. Key to Quality Gear Production — Measurement Analysis. Harold S. Ashton. *Machine and Tool Blue Book,* v. 53, Sept. 1958, p. 107-117.

(S14b, T7a)

589-S. Measurement of the Level of a Liquid Metal by Means of Gamma Rays. L. K. Tatochenko. Paper from "Problems of Metallography and the Physics of Metals", *U. S. Atomic Energy Commission,* AEC-tr-2924, 1958, p. 463-469. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

A major shortcoming of photoelectric systems is the impossibility in principle of using them to determine the level of a liquid metal covered with a layer of slag of unknown thickness. The appearance of cheap sources of gamma rays has permitted the development of a new method for measuring the level. Apparatus and technique.
(S18; 1-59, 1-53)

590-S. Determination of Iron in Uranium by the Carrier-Distillation Method Using Cobalt as an Internal Standard. John B. Ramsay. *U. S. Atomic Energy Commission, LA-2171,* 1958, 30 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

The use of 250 ppm. of cobalt as an internal standard gave a coefficient of variation of 9% and a bias of plus 6% compared to 14 and +44% respectively, in the absence of Co. 7 ref. (S11c; Fe, *U, Co*)

591-S. The Volumetric Determination of Uranium in the Presence of Molybdenum. W. C. Dietrich and J. M. Schreyer. *U. S. Atomic Energy Commission, Y-1194,* 1958, 9 p. (Available from Office of Technical Services, Washington 25, D. C.)

Method involves a collective determination of Mo and U by a Zn amalgam reduction and dichromate oxidation in a phosphoric-sulphuric acid medium. The dichromate equivalent to U is obtained by applying a correction based on an independent spectrophotometric method for Mo. 4 ref. (S11j; U, *Mo*)

592-S. Spectrographic Determination of Beryllium in a Variable Matrix. E. E. Creitz. *U. S. Bureau of Mines, Report of Investigation 5407,* 1958, 10 p.

(S11k; Be, RM-n)

593-S. (Italian.) **Recent Applications of Polarography to Metallurgical Analysis.** Elena Gagliardo. *Contributi Teorici e Sperimentali di Polarografia,* v. 2, 1956. (Supplement to *Ricerca Scientifica),* p. 309-315; v. 3, 1957, p. 212-218.

10 ref. (S11m)

594-S. (Swedish.) **X-Ray Fluorescense Analysis of Sintered Hard Metals and Carbides for Hard Metal Production.** Lennart Peterson. *Jernkontorets Annaler,* v. 142, 1958, p. 203-208.

Method wherein sample prepared by dissolving hard metal, hard metal powder or carbides in hydrofluoric nitric acid solution is determined using X-ray fluorescense and lithium fluoride analyzing crystal. Rapid and accurate determination of Ti, Ta, Cb, Zr, Fe and Co. 5 ref. (S11p; Cb, Co, Fe, Ta, Ti, Zr)

595-S. (Russian.) **Determination of the Thickness of Oxide Coatings on Aluminum Alloys.** V. P. Borzov and Ye. V. Il'ina. *Izvestiia Akademii Nauk, Seriia Fizika,* v. 19, no. 2, 1955, p. 207-208.

A method based on the relative intensity of the pairs of lines of a filler (potassium bichromate) and of the base. The porosity of the film was determined from the plot of the intensity of the lines of the filler versus the volume of the pores of the film. (S14d, P10m; Al-b)

596-S. Measurement of Casting Surface Roughness. C. H. Good and C. E. McQuiston. *Foundry Trade Journal,* v. 105, Aug. 14, 1958, p. 191-195.

(S15; 5)

597-S. Unit Finds Hidden Pipe Defects. *Steel,* v. 143, Sept. 1, 1958, p. 62-63.

(S13h; 5-60, 9-67)

598-S. What's Inside the Coil? R. Raymond Davisson. *Steel,* v. 143, Sept. 8, 1958, p. 106, 108, 110.

Quality control of tin plate in coils. (S-general; ST, Sn, 8-65)

599-S. Determination of Thorium in Uranium Ores and Feeds by Solvent Extraction Employing Thenoyltrifluoroacetone. Paul G. Laux and Ernest A. Brown. *U. S. Atomic Energy Commission, NLCO-742,* 1958, 27 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Thorium can be determined in uranium ore concentrates by solvent extraction, using TTA in xylene. Interfering elements are removed by precipitation of the acid-insoluble sulphide and the hydroxide groups. 10 ref. (S11g; U, Th)

600-S. (German.) **Surface Roughness Blocks; Manufacture and Use. Pt. 1.** H. Trumpold. *Fertigungstechnik,* v. 8, July 1958, p. 323-329.

Surface models of plastic made from original surfaces by impression. 10 ref. (S15j)

601-S. (German.) **Design of an Optical Automatic Tester for Ball Bearings.** H. Schier. *Werkstattstechnik und Maschinenbau,* v. 48, July 1958, p. 356-360.

Description of a laboratory built tester with scanning microscope and multiplier. (S13d, 1-53)

602-S. (Spanish.) **Simultaneous Potentiometric Determination of Molybdenum and Tungsten in Alloy Steels.** Ramon Suarez. *Real Sociedad Espanola de Fisica y Quimica, Anales,* v. 54 (B), Apr. 1958, p. 285-290.

9 ref. (S11m; AY, *Mo, W)*

603-S. (Book.) **ASTM Standards on Copper and Copper Alloys B5.** 688 p. Sept. 1957. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. $6.25.

Includes basic coppers, nonferrous metals used in the manufacture of Cu alloys, Cu and Cu alloy wrought products, ingots and castings, filler metal. (S22; Cu, 15-68)

604-S. (Book.) **Brittle Failure of Rotor Forgings.** 48 p. 1958. American Society for Testing Materials, Special Technical Publication, STP 231, 1916 Race St., Philadelphia 3, Pa. $2.

Problems associated with nondestructive inspection of rotor forgings. (S13, Q26s, 4-51)

605-S. (Book.) **Steel Piping Materials. A-1.** 460 p. 1958. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. $5.

Covers pipe used to convey liquids, vapors and gases at normal and elevated temperatures; still tubes for refinery service; heat exchanger and condenser tubes and boiler and superheater tubes.
(S22, W13h, 15-68)

606-S. (Book.) **Iron Castings: Compilation of ASTM Standards.** 168 p. 1958. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. $2.75.

Thirty-two standards relating to pig iron, gray iron castings, cast iron pipe, nodular iron castings, malleable iron castings, welding rods and electrodes and general methods of test.
(S22, E-general, W29h; 5-60, Fe, 15-68)

T Metal Products and Parts

369-T.* Fuel Elements. *Power Reactor Technology,* v. 1, June 1958, p. 24-36.

Development in field of reactor fuels; data on nuclear performance, mechanical properties, corrosion resistance, irradiation damage and dimensional change with irradiation for fuels including natural uranium, U-Zr, U-Mo, U-Nb, Pu-Al, Pu-U dioxide, Th-U oxide, U-Al. 48 ref.
(T11g, U, Mo, Zr, Nb, Al, Pu, Th)

370-T.* What the Aircraft Maker Wants in a Steel Casting. L. H. McCreery. *Metal Progress,* v. 74, July 1958, p. 71-75.

The logical solution to many problems facing the manufacturer of advanced aircraft and missiles is the use of high-integrity, close-tolerance steel castings. They can be heat treated to strength levels of 180,000 psi. or more and require little or no machining.
(T24a, 17-57, E-general; ST)

371-T.* A Lesson in Fabricating Nuclear Parts. *Metal Progress,* v. 74, Aug. 1958, p. 68-74.

Fabricated reactor components are produced from Zr alloys and Hf using metalworking techniques developed for precision and to avoid contamination. Welding is in a dry box, heat treating is in a vacuum; forming is done hot. Surface treatment and testing methods are also special. (T11, G-general, J-general, K-general; Zr, Hf)

372-T. Retainer Materials for Aircraft Gas Turbine Bearings. E. J. Bucur, F. C. Wagner and J. T. Burwell, Jr. Horizons Inc. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131349, Mar. 1955, 52 p. $1.50.

Alloys developed for use as retainers in rolling contact bearings. Addition of from 2 to 4% Si was found to be beneficial.
(T7d, 17-57; AD-q, Si, Ag)

373-T. Improved P.T.F.E. Impregnated Bronze Dry Bearing. *Aus-*

tralasian Manufacturer, v. 43, July 5, 1958, p. 44-46, 48-55.

New bearing consists of a steel backing to which there is sintered a spherical bronze powder impregnated with a mixture of polytetrafluoro-ethylene and lead.
(T7d; 17-57; SGA-c, Cu-s)

374-T. Materials Progress: Metals. Irwin Stambler. *Aviation Age,* v. 30, Aug. 1958, p. 54-61.

Aircraft applications of new high-strength steels; Ti, Ni-base alloys, Co-base alloys, Be, Mo, Cb, Ta, W, Cr, V, Zr and Rh. (T24; ST, Ti, Ni, Co, Be, Mo, Cb, Ta, W, Cr, V, Zr, Rh, 17-57)

375-T. M. V. Sumter—First All-Aluminum Tug. Carl W. Leveau. *Marine Engineering Log,* July 1958, p. 73-75.

Corrosion resistant, high-strength weldable alloys 5083 and 5086, developed by Kaiser Aluminum used for 55-ft. 460-hp. boat.
(T22, 17-57; Al-b)

376-T. Printed Circuits. Andre Roos. *Metal Industry,* v. 92, June 6, 1958, p. 467-470.

Processes in manufacturing printed circuits. Characteristics of Cu sheets, bonding Cu to plastic panel, etching.
(T1c, X15, 17-57; Cu, 4-53)

377-T. Materials for a Space Traveller. Rodney A. Jones. *Metal Progress,* v. 74, July 1958, p. 78-82.

How will constructional materials and instrumentation for space vehicles be affected by very high vacuum, solar radiation, cosmic rays, ionized atoms, meteorite dust, zero gravity? (T24f, 17-57)

378-T. Swedes Make Modern Bearings. A. E. Olsson. *Metal Progress,* v. 74, Aug. 1958, p. 91-93.

Electrolytic salt bath cleaning and centrifugal casting together can produce strong, long-lived bearings. A well-known European manufacturer of heavy equipment is having great success with this combination.
(T7d, L12n, E14; CI, Sn, Pb)

379-T. Smiths' Semi-Automatic Thermostat Line. T. E. W. Preston. *Metalworking Production,* June 13, 1958, p. 1027-1031.

Layout of thermostat production plant with new machinery and methods has resulted in 20% increase in output and operational accuracy of 1° C. (T21c, W25, 18-67)

380-T. The Metallurgical Contribution to Economic Nuclear Power. Alex B. McIntosh. *Royal College of Science and Technology, Metallurgical Club, Journal,* no. 10, 1957-1958, p. 13-23.

6 ref. (T11, 17-57)

381-T. Buildings Cast in Iron. F. Evans. *British Steelmaker,* v. 24, June 1958, p. 178-179.

(T26n, 17-57, A2; CI)

382-T. Tinfoil in Condenser Manufacture. *Tin and Its Uses,* no. 42, Spring 1958, p. 1-3.

(T1e, 17-57; Sn, 4-56)

383-T. (French.) **"Dauphine" Production Methods at Renault. Pt. 10.** *Machine Moderne,* v. 52, June 1958, p. 25-30.

Automatic assembly, welding and spray painting of bodies at Billancourt and Flins plants.
(T24, K-general, L26n, 18-67)

384-T. Materials for Ballistic Rockets. V. Parfenov. *Sovietskaya Aviatsiya,* no. 277, Nov. 24, 1957, p. 3. (Henry Brutcher, Altadena, Calif., Translation no. 4208.)

General survey of conditions encountered by rockets. High-melting and heat-resisting metals suitable for radomes and radome coatings; materials for fuel and oxidant storage; Ta as lining material for nitric acid tanks. (T24e, 17-57, SGA-h)

385-T. Summary of Development and Evaluation of Insulating-Type Refractory Coatings. S. Sklarew, C. A. Hauck and A. V. Levy. Marquardt Aircraft Co. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 121759, Oct. 1956, 96 p. $3.75.

Coatings to provide thermal insulation to aircraft and missile structural members operating in the 2000 to 3000° F. range. Reinforced refractories 0.080 to 0.15 in. thick providing thermal drops of 5 to 10° F. per 0.001 in. of thickness were successfully tested on a small scale. (T24b, 17-57; RM-h40, 8-71)

386-T.* (Italian.) **Molybdenum as a Heating Element for Electric Resistance Furnaces.** O. Dorigo. *Elettrotecnica,* v. 45, Apr. 25, 1958, p. 229-232.

Physical properties of Mo; use as heating element in industrial furnaces, particularly those used in sintering of Fe powders and manufacture of cermets. Behavior of Mo in prepared atmospheres. 10 ref.
(T1f, W26e, 17-57; Mo)

387-T. The Importance of Platinum in Petroleum Refining. Claude C. Peavy. *Platinum Metals Review,* v. 2, Apr. 1958, p. 48-52.

Platinum catalyst refining of low-octane straightrun naptha fractions of the crude to extremely high-octane levels is the most likely process used in producing fuels for modern aircraft and automobile engines. Process is versatile and produces profitable byproducts. 6 ref.
(T29d, T29n, 17-57; Pt)

388-T. (French.) **Lightness in Welded Construction Steel Assemblies Combining Welded and Mechanical Joints.** A. Ogus. *Revue de la Mecanique,* v. 109, Mar. 1958, p. 175-177.

(T26; ST, 7-51)

389-T. (Hungarian.) **Use of Blast Furnace Slags in Agriculture.** Istvan Palfalvi. *Kohaszati Lapok,* v. 91, Apr. 1958, p. 196-200.

Silica content improves texture of loose sandy soils. Manganese content is helpful in Mn-deficient soils. 26 ref.
(T3p, 17-57; Fe, RM-q)

390-T. Found—a Low-Alloy Steel for Missiles. William M. Stocker, Jr. *American Machinist,* v. 102, Aug. 25, 1958, p. 72-73.

U. S. Steel Corp.'s Airsteel X-200, developed to solve missile manufacturing problems, is as workable as AISI 4340 and air hardenable to 280,000-psi tensile strength.
(T24e, 17-57, Q27a; AY)

391-T. (French.) **Copper Through the Ages.** Roger Vaultier. *Cuivre Laitons Alliages,* no. 43, May-June 1958, p. 24-26.

Decorative pieces of Cu and Cu and Ag of the 13th and 14th centuries. (To be continued.)
(T9q, 17-57, A2; Cu, Ag)

392-T. (French.) **Metallurgical Problems of Nuclear Reactors. Structural Materials.** Jean Bernard. *Energie Nucleaire,* v. 2, Apr-June 1958, p. 73-97.

5 ref. (T11, 17-57)

393-T. (French.) **Aluminum in the Atomic Pile at Centre de Saclay.** Louis Badin, Pierre Coutou and Maurice Victor. *Revue de l'Aluminium,* no. 255, June 1958, p. 644-650.

(T11q, T26q, 17-57; Al-b)

394-T. (French.) **Casting of "55" Air-brake Distributor.** Andre Chevrier. *Revue de l'Aluminium,* no. 255, June 1958, p. 663-668.

Complexity of Westinghouse compressed air brake distributor requires high accuracy in casting and assembling. (T23s, E11, Al, 5-60)

395-T. (Polish.) **Steel-Aluminum Trolley Wires for Transportation Systems.** Leszek Godecki. *Hutnik,* v. 23, Sept. 1956, p. 340-343.

Previously abstracted from original. See item 11-T, 1957.
(T1, 17-57; Al, ST)

396-T. (German-French.) **Durable Thread Inserts for Light Metal.** *Aluminium Suisse,* v. 8, no. 2, Mar. 1958, p. 67-68.

Uses of "Heli-Coil" Cr-Ni steel threading inserts. (T7f; AY, *Cr, Ni)*

397-T. (Book.) **Lubrication of Bearings.** F. T. Barwell. 292 p. 1956. Butterworths Scientific Publications, 88 Kingsway W.C. 2, London.

Modes of lubrication, wear and its mechanisms, viscosity, principles of hydrodynamic lubrication, journal bearings subject to variable loading, thrust bearings, concentrated contact bearings, externally pressurized bearings, reciprocating sliders and oscillating bearings.
(T7d, 18-73; NM-h)

398-T. (Book.) **Nuclear Reactor Metallurgy.** Walter D. Wilkinson and William F. Murphy. 382 p. 1958. D. Van Nostrand Co., Inc., 120 Alexander St., Princeton, N. J. $5.60.

Introduction for engineers and students. Covers production of uranium metal from ores; structure and properties of U; U alloys; heat treatment, fabrication, powder metallurgy, corrosion, surface protection of U; metallurgy of Pu, Th, Be, Zr; properties of liquid metals and ceramics; effects of neutron radiation on nonfissionable metals and alloys; nondestructive testing of reactor components.
(T11, 17-57; Be, Pu, Th, Zr, 17-67)

W Plant Equipment

415-W.* (German.) **Hundred Years of Regenerative Firing. Growth of the Openhearth Furnace.** Franz Bartu. *Stahl und Eisen,* v. 78, May 29, 1958, p. 713-733.

Invention of the regenerative furnace system by F. Siemens 100 years ago. First industrial applications. Production in 1863 of the first openhearth steel by P. Martin in a Siemens-type regenerative furnace. Evolution of the openhearth furnace up to the present; importance of refractories and their development. Development of individual parts of the furnaces, especially of the regenerators. Fuels used; the tilting openhearth furnace; heat economy; theoretical fundamentals for the construction of furnaces. 82 ref. (W18r, A2)

416-W. Research on Liquid Metals as Power Transmission Fluids. R. H. Blackmer. General Electric Co.

(*)**Articles Available Through Photocopy Service; See Coupon, p. 75.**

(Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131743, Feb. 1958, 100 p. $2.50.

NaK 77 was the most feasible liquid known for aircraft hydraulic system applications in the 10 to 1000° F. temperature range. (W11; Na, K, 1-70, 14-60)

417-W. New Plant at Shepcote Lane Rolling Mills. *British Steelmaker,* v. 24, June 1958, p. 182-185.

Plant for wide stainless steel strip includes Sendzimir cold mill, 35 by 72-in. 2-high reversing roughing mill, reversing hot finishing mill now converted to a Stackel mill, and 4-high reversing cold reduction mill. (W23c; ST)

418-W. Mercury Arc Converters for Large Reversing Drives. *British Steelmaker,* v. 24, June 1958, p. 186-188. (W11, W23n)

419-W. New Metal Finishing Installations at Vauxhall Motors Ltd. Pt. 3. The Morrisflex-Hammond and Acme Automatic Polishing Equipments. *Electroplating and Metal Finishing,* v. 11, June 1958, p. 201-206.

Equipment for buffing and polishing Cu-plated auto components. (W2n, L10a; *Cu,* 8-12)

420-W. A Versatile Vacuum Furnace. B. L. Molander. *Metal Treating,* v. 9, July-Aug. 1958, p. 2-3.

Problems associated with the production brazing, heat treating, annealing and stress relieving of Ti are being solved with new vacuum furnace. (W27, 1-73, J-general; Ti-b)

421-W. Titanium Rod and Sheet. *Metal Industry,* v. 92, June 13, 1958, p. 487-489.

Factory includes rod plant, containing Robertson 2-stand 3-high mill, Morgardshammer 5-stand guide mill, finishing machines and furnaces, and sheet plant, containing Brightside 3-high mill, Robertson 4-high mill, Sack 4-high, furnaces, cutting equipment, and descaling plant. (W23d, W23c; Ti, 4-55, 18-67)

422-W. Recent Heat Treatment Furnace Installations. *Metallurgia,* v. 57, June 1958, p. 283-302.

Variety of heat treating furnaces recently installed in Great Britain. (W27; 17-51, 17-52)

423-W. (French.) **A New Device for Mechanical Weighting of Molds.** *Journal d'Informations Techniques des Industries de la Fonderie,* v. 95, Apr. 1958, p. 5-8.

Patented turntable device installed in conveyer molding line at Ouillins removes weights from filled molds and places them slowly and in exact position required on molds approaching pouring zone. (W19g, W12s)

424-W. (French.) **A Cart for the Cupola Tender.** *Journal d'Informations Techniques des Industries de la Fonderie,* v. 95, Apr. 1958, p. 12-14.

Compact hand truck includes receptacles and shelves for tools and materials, small desk. (W12n)

425-W. (German.) **Influence of the Design and Operation of Pusher-Type Furnaces on the Surface Finish of the Products Reheated Therein.** Berthold von Sothen. *Stahl und Eisen,* v. 78, May 29, 1958, p. 733-736. (W27, 17-51, 17-52)

426-W. (German.) **Design of Convertible Machine Tools.** H. Puschmann. *Werkstattstechnik und Maschinenbau,* v. 48, June 1958, p. 308-309.

Standardization of parts and prefabrication of assembly units. (W25, 17-51)

427-W. (German.) **Lacquer Spraying and Drying Plants.** F. Fessel. *Werkstattstechnik und Maschinenbau,* v. 48, June 1958, p. 323-327. (W4, L26n)

428-W. (German.) **New Pressure Sintering Plant of the Stolberger Zinc A.G.'s Lead Smelter in Binsfeldhammer.** Rudolf Schmidt and Reinhard Fischer. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 11, July 1958, p. 301-310. (W15, B16a; Pb)

429-W.* (French.) **How to Build a Steel Mill.** Claude Laperrousaz. *Manutention,* no. 46, Apr. 1958, p. 73-78.

Two possible plant layouts and sets of equipment for mass production of 500-kg. ingots are analyzed in terms of efficiency, safety, investment, maintenance, space requirements and other factors. Coefficient of use of cranes becomes governing factor in selection and placement of equipment, including cranes themselves, to handle raw materials and product of 50-ton electric furnace to be tapped approximately every 200 min. (W10a, W12q, W18s, 1-52; ST)

430-W.* (German.) **Experiences With Permanent Molds.** Hermann Wesner. *Freiberger Forschungshefte,* no. B30-1, 1958, p. 46-67.

In the manufacture of permanent molds the preservation of the cast skin on all surfaces that will come in touch with the molten steel is important. Only core-marks are machined. The undivided half-mold with a false core is most suitable. The false core has to be fitted with the pouring basin and sprue and with efficient risers, for risers in the mold itself would not provide the sufficient pressure to avoid pipes, and pouring immediately against the mold would cause fast wear. In the experiments, the molds were blackened successfully with a mixture of soot and alcohol. All the experiments were made with electric steel. (W19g, E12; ST)

431-W.* (German.) **How to Increase the Durability of Cast Iron Permanent Molds.** Walter Feicke and Georg Arand. *Freiberger Forschungshefte,* no. B30-1, 1958, p. 135-180.

Material used is different for each type of production; cast iron for steel mill ingot molds; alloy steel and nickel alloy cast iron for centrifugal castings; gray cast iron and carbon steel for shaped castings. Thermal resistance in relation to the tensile strength, Brinell hardness and thermal conductivity; dimensional stability at various temperatures. Suggested materials are of stable ferrite or pearlite structure with the graphite particles as short as possible. 38 ref. (W19g, 17-57, P10d, Q27a, Q29b; AY, CI, CN)

432-W.* (French.) **Contribution to the Study of Rolling Mill Equipment. Pt. 2. Rolling Mills. Sect. 6, Rod and Strip Mills.** G. Grenier. *Echo des Mines et de la Metallurgie,* no. 3516, May 1958, p. 293-295.

Roll trains in U S. for making 18-8 stainless steel rod. European strip mills from about 1900 to present. (To be continued.) (W23c, W23d, 1-52, A2)

433-W. Vacuum Melting and Heat Treating. Pt. 2. Vacuum Heat Treating. Roger R. Giler. *Industrial Heating,* v. 25, Aug. 1958, p. 1516-1520, 1522, 1524, 1526, 1670.

Furnace design. (W27n, J2k, 1-73)

434-W. How to Select Copper-Base Rods. *Metalworking,* v. 14, July 1958, p. 16-19.

Data on composition, hardness and welding utilization of Cu-base electrodes and filler rods. (W29h, 17-57; Cu)

435-W. (Russian.) **Study of New Die Steels for Stamping Heat Resistant Alloys.** A. P. Gulyaev, S. L. Pustem and G. N. Orekhov. *Metallovedenie i Obrabotka Metallov,* July 1958, p. 2-10.

Review of developments in U.S.A., Britain, France and Switzerland. 7 ref. (W24n, 17-57; ST, SGA-h)

436-W. (Russian.) **Highly Stable Electrodes for Electro-Impulse Treatment of Metals.** A. L. Livshits, G. K. Bannikov and A. M. Sigarev. *Stanki i Instrument,* v. 29, May 1958, p. 23-25.

Possibility of replaceing Cu with carbon electrodes, which reduces cost by 50%. Stability of carbon electrodes is determined by porosity of metal welded and its crystal structure. Durability of electrodes increases with decrease in grain size. (W29h, 17-57; Cu, C)

437-W.* (German.) **Aluminum Lengthwise-Finned Heat Exchangers. Pt. 1.** F. Lohmann. *Aluminium,* v. 34, July 1958, p. 410-416.

Advantages of Al for use in heat exchangers; temperature and pressure limitations; designing to utilize high thermal conductivity of Al, possibilities for the use of extruded sections; theoretical considerations in heat transfer. (W13b, 17-57, 17-51; Al, 4-58)

438-W. The Largest Pressing Facility Yet. *Canadian Metalworking,* v. 21, Aug. 1958, p. 52, 54, 56.

Huge steel presses developed for vast reactor vessels used for nuclear power purposes. (W24g, W11p)

439-W. (French.) **Copper Alloys for Welding Electrodes.** C. Lachaud. *Cuivre Laitons Alliages,* no. 43, May-June 1958, p. 11-18. (W29, 17-57; Cu-b)

440-W. (German.) **Composition and Behavior of Special Steel Alloy Dies in Pressure Die Casting.** K. J. Bengtsson. *Giesserei-Praxis,* v. 14, July 25, 1958, p. 278-279. (W19n, 17-57, Q-general, R6m; AY)

441-W. (Russian.) **Use of Martensite for Repairing Openhearth Furnace Bottoms.** F. Z. Dolkart, P. P. Semenenko and S. G. Slesarev. *Stal',* v. 18, July 1958, p. 604-606. (W18r; RM-h)

442-W.* (German.) **Trends in the Automation of Iron Mills.** Hans Vogel. *Stahl und Eisen,* v. 78, July 24, 1958, p. 1033-1038.

Processes, measuring and counting devices for automation of rolling mills. Individual drive by d.c. motors allows a better adjustment of the rpm. using automatic control devices and is preferred. In large automatic systems, space-saving, wear resistant and maintenance-free low-tension equipment is replacing heavy equipment. Description of automated continuous hot rolling trains, reversing trains and cold rolling mills. (W23, 18-74)

443-W.* (German.) **Firing of Small Forge Furnaces With Heavy Fuel Oil.** Hugo Remus. *Stahl und Eisen,* v. 78, July 24, 1958, p. 1038-1041.

Transport and piping of heavy oil. Design of experimental furnaces suitable for this fuel; main features are: high air-pressure burner; deviated flame to avoid wear of lining; pneumatically opened door, protected by a water spray. The oil consumption was found to be rather high, yet may be reduced by increasing the hearth-area efficiency. (W20h, 1-52; RM-k30)

444-W. A. C. Electric Power for Melting Metals. Pt. 1. W. L. Harrison. *Electrical Energy,* v. 2, July 1958, p. 250-256.

Characteristics of direct arc, indirect arc, coreless induction and other type furnaces, voltage flicker, power factor, electrical efficiency. (To be continued.) (W18a, W18s, 16-61, 1-52)

445-W. Painting and Anodizing Rack Design. Henry Kraus. *Metal Finishing,* v. 56, Aug. 1958, p. 62-69.

(W3g, 17-51, L26, L19)

446-W. Mechanical Presses—Their Selection, Design and Function. Chapter 9. Electrical Press Controls. Pt. 1. Protection of Operator. *Metal Forming and Fabricating,* v. 20, Aug. 1958, p. 21-23.

(W24g, 1-52, A7)

447-W. Performance of Forsterite Refractories in Bottoms of Forge Reheating Furnaces. V. I. Sinyanskii. *Ogneupory,* v. 22, no. 12, 1957, p. 568-571. (Henry Brutcher, Altadena, Calif., Translation no. 4266.)

(W27, 1-52; RM-h)

448-W. (German.) **Determination of Tolerances in the Design of Punches and Dies.** L. Segalle. *Fertigungstechnik,* v. 8, May 1958, p. 209-217.

In the design of tools, special construction features, structural properties and thickness of the sheet metal to be used in production. The size and shape of parts to be manufactured and the clearance between punch and die should be taken in consideration. (W24n, W24p, 17-51)

449-W. (German.) **A New Type Grinding Wheel.** H. Kohlhase. *Fertigungstechnik,* v. 8, July 1958, p. 315-316.

A special grinding wheel fitted with bristles and abrasive cloth machine-grinds inaccessible lacquered surfaces. (W25c)

X Instrumentation

Laboratory and Control Equipment

75-X. Creating Test Atmospheres at −260° F. M. John Brown and Gordon V. Thompson. *ASTM Bulletin,* no. 231, July 1958, p. 59-61.

Portable laboratory cold flask permits operation of a dry atmosphere test chamber at temperatures as low as 260° F. for about 12 hr. (X29r, 1-53, 1-67)

76-X. (French.) **Servo-Pyrometer. Measurement of Infra-Red Temperatures.** A. Peuteman. *Automatisme,* v. 3, June 1958, p. 214-217.

(X9r, S16)

77-X.* (French.) **Device for Measuring Internal Friction in Rigid Specimens.** Gaston Collette. *Comptes Rendus,* v. 246, May 12, 1958, p. 2756-2758.

Device makes it possible to measure, at about atmospheric temperature, coefficient of internal friction of thin strips of metal subjected to low-frequency alternate stresses. Limit of solubility of nitrogen in ferrite at 100° C. was determined. (X28, 1-53, Q22)

78-X. (Czech.) **Apparatus for Differential Thermal Analysis.** Antonin Blazek and Jan Halousek. *Hutnické Listy,* v. 13, 1958, p. 505-509.

Requirement for experimental unit. Simple apparatus designed on principle of galvanometric amplifier for automatic direct recording of differential thermal analysis curves. Technical conditions important to correct functioning of apparatus. 13 ref. (X9s)

79-X. (Russian.) **Investigation and Choice of Alloys for High-Temperature Thermocouples.** A. A. Rudnitskiy and I. I. Tyurin. *Zhurnal Neorganicheskoi Khimii,* no. 5, 1956, p. 1074-1090.

Alloys for high-temperature thermocouples, operating in air, stable during prolonged operation at 1350 to 1550°, and suitable for short duration up to 1800°. The thermal electrodes investigated were pure Rh, alloys of Pt with Rh, and triple alloys Pt-Rh-W and Pt-Rh-Re. (X9q, 17-57; Rh, Pt)

80-X. A High-Temperature Vacuum Quench Furnace. S. B. Austerman, G. M. Wolten and C. T. Broman. *U. S. Atomic Energy Commission, NAA-SR-2312,* 1958, 13 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

Design and operation of a furnace for heating and quenching refractory specimens in vacuo or controlled atmosphere. The specimen can be dropped at will from the heated zone into a quenching cup. The furnace has been operated at temperatures as high as 2400° C. (X24f, W27n, 1-73)

81-X. Automatic Control of a New Continuous Bloom Reheating Furnace. *British Steelmaker,* v. 24, July 1958, p. 218-219.

(X9s, W10h, 1-52)

82-X. Why Not Ceramic as a Material for Gages? Carl G. Erickson. *Machine and Tool Blue Book,* v. 53, Sept. 1958, p. 129-131.

(X20, 17-57; NM-f)

83-X. A Rotatable-Magnet Permeameter. R. K. Tenzer and M. A. Bohlmann. Indiana Steel Products Co. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131352, July 1956, 9 p. $.50.

Permeameter which derives the variable magnetomotive force across its air gap from the rotation of a permanent magnet. In the common permeameter, the variable magnetic field is provided by an electric current. The general purpose of the device is the determination of the magnetic properties of a test specimen and, in particular, visual indication of the major or minor hysteresis loops of a test specimen under varying magnetic field conditions. (X26, 1-53)

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METALLURGIST: Advanced degree and 15 years diversified experience. Research and development of stainless alloys with emphasis on weldability and engineering properties. Powder metallurgy of refractory metals, including rolling, forming, extruding, welding, vacuum arc melting. Materials engineering and consulting. University teaching. Prefers to work with small or medium-size company in Midwest which can make good use of this experience. Box 10-30.

METALLURGICAL ENGINEER: Twelve years diversified experience in ferrous and nonferrous metallurgy serving automotive, instrument, electrical and steel industries. Sales, research and manufacturing background. Desires position with opportunity in which organizational ability and leadership are combined with a practical knowledge of metallurgy as applied to peace-time applications. Box 10-35.

METALLURGIST: M.S. degree, age 35, family. Nine years experience in basic and applied research. Well rounded background in physical and mechanical metallurgy. Publications. Heavy experience in X-ray diffraction, phase diagrams, vacuum techniques and titanium. Capable of supervising X-ray diffraction laboratory, however, will accept other responsible position with opportunity for advancement. West Coast. Box 10-40.

POWDER METALLURGIST: Eight years experience in research and development. Broad background in refractory metals, refractory carbides, graphites and infra-cermets. Experienced in all processes and fabrication techniques, including powder rolling, concerning powder metallurgy. Interested in setting up powder rolling plant for fabrication of refractory metals. Capable of handling development programs. B.S. equivalent. AEC "Q" clearance. Married, age 34. Box 10-45.

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GENERAL MANAGER: With 25 years management experience including special assignments for two periods of high production war material. Strong metallurgical background. Work covered many phases of manufacturing including effective coordination of engineering, finance, purchasing, quality control, sales, personnel and research. Prefers Cleveland area. Box 10-90.

METALLURGIST: B.S. degree, age 45, married. Extensive experience managing large and small commercial heat treating plants for 12 years. Formerly chief metallurgist in large aircraft plant, supervising metallurgical laboratory controlling materials, heat treating, processing, including investigations of field failures, plant problems, quality control, development. Three years openhearth steelmaking experience. Broad experience in all phases of heat treating and knowledge of materials. Box 10-95.

METALLURGIST: Experienced as laboratory and manufacturing department head. Responsible for material specifications, inspection standards, heat treat specifications and failure analysis. Able to work with and direct personnel to successful completion of projects. Looking for position as staff consultant or technical director. Will relocate. Resume on request. Box 10-100.

METALLURGIST-CERAMIST: B.Ch.E. degree. Seventeen years development, with leaning toward manufacturing management: ceramic coatings, bodies, glass compositions, glass-to-metal seals, hot pressing, sintering; nuclear fuel elements, nonferrous sand and centrifugal castings, extrusions, plastics. Training in business administration, production controls. Desires resposible position in manufacturing or pilot-type development. Box 10-105.

METALLURGICAL ENGINEERING: B.S. degree, age 32. Five years heat treat supervision. Employed past two years by helicopter manufacturer investigating fatigue and service failures. Desires permanent, responsible position in heat treat supervision, failure analysis, materials and process, quality control or liaisons. Southern location, costal area preferred. Box 10-110.

METALLURGIST: B.S. degree, graduate study. Five years experience. Physical-mechanical metallurgy—development, quality analysis, troubleshooting. Desires responsible position within 100 miles of New York City. Age 27, single. Box 10-115.

METALLURGICAL ENGINEER: B.S. degree, age 30, married, family, veteran. Eight years diversified experience in research and development laboratories. Background includes copper base and titanium alloys. Experienced in corrosion analysis and statistical quality control. Capable of handling problems quickly and efficiently. Willing to start in new fields which offer challenge and advancement. Box 10-120.

METALLURGICAL CHEMIST: M.S. degree. Ten years experience in metallurgical research and process development including hydro and pyrometallurgy; production of powdered metals, ductile cermets, ceramics; rolling metal powders, cermets into strip; alloying, rolling, spherizing high-purity semiconductor alloys. Patents. Desires research and development position with manufacturing or processing firm. Box 10-140.

PHYSICAL METALLURGIST: With metallurgical engineer degree and advanced studies. Married, family, veteran. Experience in research and development, several papers. Exceptionally broad experience in machine tools and experience in development of new alloys, corrosion, fabrication. Seeks position of challenging nature with opportunity for administrative experience and advancement. Will relocate. Resume upon request. Box 10-145.

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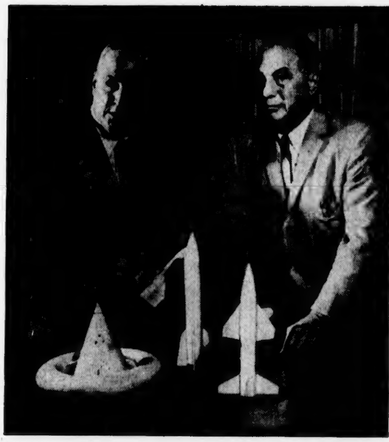

A $14,000,000 R & D Center, housing 9 new laboratories, was revealed as core of Republic's $35,000,000 Research and Development Program at recent announcement by Mundy I. Peale, President, and Alexander Kartveli, Vice-President for Research and Development.

....To join Republic Aviation's new $35 million Research and Development Program for spacecraft, missiles and advanced aircraft

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>
> "...RADICAL NEW FAMILIES OF LONG-RANGE AIR-TO-AIR MISSILES AND AIR-TO-SURFACE BALLISTIC MISSILES FOR STRATEGIC AND TACTICAL AIRCRAFT."
>
> "...VERTICAL TAKE-OFF FIGHTER-BOMBERS, HIGH-MACH FIGHTER-BOMBERS, AND SUPERSONIC TRANSPORTS."

Alexander Kartveli, Vice-President for Research and Development, emphasized that Republic's program "will not duplicate in any way investigatory work currently in progress elsewhere, but will stress novel concepts and new approaches to basic problems of missiles and space technology."

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GUIDANCE & CONTROL SYSTEM DEVELOPMENT LABORATORY
To develop and test guidance and control systems for spacecraft, missiles and aircraft.

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Albuquerque	Nov. 20		M. A. Scheil	National Officers Night
Baltimore	Nov. 17	Engineers Club	S. R. Whipple	Tools of Telephony
Birmingham	Nov. 4	Thomas Jefferson Hotel	E. E. Stansbury	Some Problems in Understanding Alloy Effects in Steel
Chicago	Nov. 10	Furniture Club	D. J. McPherson	Metallurgy of the Newer Metals
Chicago-Western	Nov. 17	Old Spinning Wheel	W. R. Rostoker	Why Beryllium?
Cincinnati	Nov. 13	Engineering Society	A. C. Nehrenberg	Toolsteel
Dayton	Nov. 17	Suttmiller's		Joint Meeting With American Society of Tool Engineers
Detroit	Nov.	Engineering Society	J. Spretnak	Russian Metallurgy
East'n New York	Nov. 11	Panetta's		Metallurgy in the Automobile
Ft. Wayne	Nov. 10	Hobby Ranch House	C. E. Betz	Penetrant Inspection
Hartford	Nov. 11	Indian Hill Country Club	Panel	Machining Metals Over 60 Rc
Kansas City	Nov. 19	Golden Ox	V. E. Lysaght	Hardness Testing
Lehigh Valley	Nov. 7	Hotel Traylor	M. V. Herasimchuk	Vacuum Degassing
Los Angeles	Nov. 20		I. H. Such	Russia Today
Mahoning Valley	Nov. 11		J. Gurski	Nonferrous Metals in the Automotive Industry
Milwaukee	Nov. 18	City Club	R. J. Zale	Understanding Toolsteels
Montreal	Nov. 10			A Visit to Russia
Muncie	Nov. 11	Ball State Students Center	J. C. Hamaker, Jr.	Toolsteels, Properties and Applications
New Jersey	Nov. 17	Essex House	N. K. Koebel	Heat Treating in Controlled Atmosphere
New York	Nov. ..	Brass Rail		
NE Pennsylvania	Nov. 13		E. M. Kipp	
North Texas	Nov. 6		W. H. Dunn	Shell Molding of Stainless and High Alloy Steels to Rigid Specifications
Notre Dame	Nov. 12		K. E. Nelson	Metallurgy and Heat Treatment of Magnesium Castings and Forgings
Oak Ridge	Nov. 19	K of C Hall	L. S. Birks	The Electron Probe Microanalyzer
Ontario	Oct. 31	Beacon Hotel	James Parr	
Oregon	Nov. 11		K. B. Young	
Penn State	Nov. 11			Metallurgical Problems of Reactors
Philadelphia	Nov. 14-15	Penn State University	Interchapter Conference	Production Methods and Operations Research in Metallurgy
Junior Section	Nov. 5		Plant Tour	Colorado Fuel & Iron Co.
Pittsburgh	Nov. 13	Gateway Plaza	C. H. Lorig	
Richmond	Nov. 12	Holloway House	S. J. Sansonetti	Aluminum Finishing
Rockford	Nov. 19	Hotel Faust	H. Hunsicker	Physical Metallurgy and Applications of Aluminum Alloys
St. Louis	Nov. 20	Ruggeri's	E. N. Skinner	High-Temperature Corrosion
Saginaw Valley	Nov. 11	High-Life Inn	W. Z. Friend	Corrosion of Metals and Alloys
Santa Clara Valley	Nov.	Milpitas	Tour	Ford Plant
Savannah River	Nov. 13		E. M. Wise	Metallurgy of Nickel and Palladium
Southeast Ohio	Nov. 6		B. M. Shields	Making of High-Quality Steels
Southern Tier	Nov. 17	Baron Steuben Hotel	F. M. Richmond	High-Temperature Alloys
Springfield	Nov. 10	Oaks Inn	C. H. Lorig	Selection of Materials in this Changing World
Texas	Nov. 4	Engineers Club	W. M. Baldwin	Physical Properties Involved in Why Metals Bust
Toledo	Nov. 13	River Rouge	Tour	Ford Motor Co. Steel Mill
Tri-City	Nov. 11		E. V. Crane	Work Hardening of Metals in Press Operations
Tulsa	Nov. 4	Alvin Hotel	W. W. Wentz	Titanium
Washington	Nov. 10	Dodge Hotel	W. Steurer	New Material Developments for the Space Age
West Michigan	Nov. 17	Schnitzelbank	W. E. Littmann	Grinding of Steel
Worcester	Nov. 12	Hickory House	C. H. Lorig	
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